ORDER NO. KM49302449A3

Service Manual

Simplified

and Technical Guide

TELEPHONE ANSWERING
SYSTEM WITH FACSIMILE

KX-F230BX

(for Asia, Middle Near East and Other areas)

Please use this manual together with the Service Manual for model No. KX-F230, order No. KM49301413C1.
This Service Manual indicates the main differences between; Original KX-F230 and KX-F230BX.

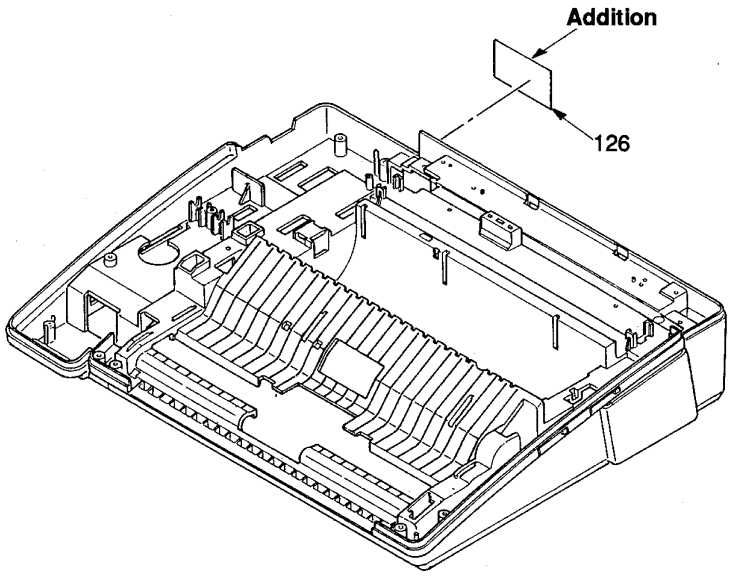
■ SPECIFICATIONS (Change of original page 4)

4. GENERAL

Power Supply:	AC 120 V, 60 Hz (Model KX-F230)	➜	AC 220–240 V, 50/60 Hz (Model KX-F230BX)

■ CABINET, MECHANICAL AND ELECTRICAL PARTS LOCATION

2. UPPER BODY SECTION (Change of original page 197)



Panasonic

■ REPLACEMENT PARTS LIST (Change of original pages 203~212)

REPLACEMENT PARTS LIST

Model KX-F230BX

Notes:

1. RTL (Retention Time Limited)
   The marking (RTL) indicates that the Retention Time is limited for this item.
   After the discontinuation of this assembly in production, the item will continue to be available for a specific period of time. The retention period of availability is dependant on the type of assembly, and in accordance with the laws governing part and product retention.
   After the end of this period, the assembly will no longer be available.
2. Important safety notice
   Components identified by the ⚠ mark special characteristics important for safety.
   When replacing any of these components, use only manufacturer's specified parts.
3. The S mark indicates service standard parts and may differ from production parts.
4. RESISTORS & CAPACITORS
   Unless otherwise specified,
   All resistors are in ohms (Ω) K=1000Ω, M=1000KΩ
   All capacitors are in MICRO FARADS (μF) P= μμF
   *Type &Wattage of Resistor

Type

ERC: Solid	ERX: Metal Film	PQ4R: Carbon
ERD: Carbon	ERG: Metal Oxide	ERS: Fusible Resistor
PQRD: Carbon	ER0: Metal Film	ERF: Cement Resistor

Wattage

10, 16: 1/8W	14, 25, S2: 1/4W	12, S1: 1/2W	1: 1W	2: 2W	3: 3W

Type

ECFD: Semi-Conductor	ECCD, ECKD, ECBT, PQCBC: Ceramic
ECQS: Styrol	ECQE, ECQV, ECQG: Polyester
PQCUV: Chip	ECEA, ECSZ: Electrolytic
ECQMS: Mica	ECQP: Polypropylene

Voltage

ECQ Type	ECQG ECQV Type	ECSZ Type	Others	
1H: 50V	05: 50V	0F: 3.15V	0J: 6.3V	1V: 35V
2A: 100V	1: 100V	1A: 10V	1A: 10V	50, 1H: 50V
2E: 250V	2: 200V	1V: 35V	1C: 16V	1J: 63V
2H: 500V		0J: 6.3V	1E, 25: 25V	2A: 100V

Ref. No.	Part No.	Part Name & Description	Pcs
		CABINET, MECHANICAL AND ELECTRICAL PARTS	
		(1. OPERATION PANEL SECTION)	
1	PQGP10029Y	PANEL, LCD	1
2	PQGV10005Z	TRANSPARENT PLATE, TEL. NO. CARD	1
3	PQGD10040Z	CARD, TEL. (LARGE)	1
4	Not Used		
5	PQGG10013Y2	OPERATION PANEL	1
6	PQGP10024Z	LED COVER-A	1
7	PQGP10025Z	LED COVER-B	1
8	PQGP10026Z	LED COVER-C	1
9	PQBX10059Z2	BUTTON, FAX MENU, ITS	1
10	PQBX10060Y2	BUTTON, TAM	1
11	PQBX10066Z2	BUTTON, FAX FUNCTION	1
12	PQBX10065Z2	BUTTON, FAX FUNCTION	1
13	PQBX10041X2	BUTTON, DIALER	3
14	PQBX10058Y2	BUTTON, DIAL	1
15	PQBC10047Z1	BUTTON, SP-PHONE	1
16	PQBC10044Z2	BUTTON, STOP/CLEAR	1
17	PQBC10046Z2	BUTTON, COPY	1
18	PQBC10045Z1	BUTTON, START	1
19	PQDE10010Y	LEVER, READ DETECTION	1
20	PQUS10019Z	SPRING-A, DOCUMENT DETECTION LEVER	1
21	PQUS315Z	SPRING-B, DOCUMENT DETECTION LEVER	1
22	PQDE10009Z	LEVER, DOCUMENT DETECTION	1
23	PQUS10011Z	SPRING, ROLLER	2
24	PQDR9685Z	SUB ROLLER-A	1
25	PQDR16Z	SUB ROLLER-B	1
26	PQDF10004Z	SHAFT-A, SUB ROLLER	1
27	PQDF9057Z	SHAFT-B, SUB ROLLER	1
28	PQUS10022Y	SPRING, SUB ROLLER	1
29	PQUV10002W	COVER, OPERATION PANEL	1
30	PQHX10078Y	READING PLATE	1
31	PQUS10010Z	SPRING, SEPARATION	1
32	PQUS10008Z	SPRING, DOCUMENT FEED	2
33	PQHR10056Z	GUIDE	1
34	PQHG10038Y	SEPARATION RUBBER	1
35	PQMH10017Z	ANGLE-L, PANEL SIDE	1
36	PQUS10015Z	SPRING-L, PANEL OPEN/CLOSE	1
37	PQHD10010Y	SCREW	2
38	PQMH10015Z	ANGLE-L, PANEL OPEN/CLOSE	1
39	PQMH10016Z	ANGLE-R, PANEL OPEN/CLOSE	1
40	PQUS10016Z	SPRING-R, PANEL OPEN/CLOSE	1
41	PQMH10018Z	ANGLE-R, PANEL SIDE	1
42	PQJS20R83Z	CONNECTOR, 20P	1
43	PQKK10015X2	LID, TAM	1
44	PQHX10194Z	SHEET	1
45	PQBX10062Y2	BUTTON, DIRECTORY	1
46	PQHX10193Z	SHEET	2
		(2. THERMAL HEAD SECTION)	
60	PQKE10007Y2	TRAY	1
61	PQKV10013Z2	COVER, RECORDING PAPER	1
62	PQGP10014Z	PANEL, RECORDING PAPER	1
63	PQKR10001Z2	GUIDE-L, DOCUMENT	1
64	PQKR10002Z2	GUIDE-R, DOCUMENT	1
65	PQDG10007Z	GEAR, DOCUMENT GUIDE	1
66	PQMD10007Y	ANGLE-A, RECORDING PAPER COVER	1
67	PQMD10010Z	ANGLE-B, RECORDING PAPER COVER	1
68	PQDF10008Z	SHAFT, ARM	2
69	PQMD10008Z	FRAME, RECORDING PAPER COVER	1
70	PQHR10054Z	ARM-L	1
71	PQMH10013Z	ANGLE-L	1
72	XUC25FY	RETAINING RING	4
73	PQUS10012Z	SPRING-L, ANGLE-L	1
74	PQDE10005Z	GUIDE-L, THERMAL HEAD	1
75	PQUS10009Z	SPRING, THERMAL HEAD	3
76	PQHD10012Z	SCREW	1
77	PQDE10006Z	GUIDE-R, THERMAL HEAD	1
78	PQHR10055Z	ARM-R	1
79	PQUS10013Y	SPRING-R, ANGLE-R	1
80	PQMH10014Z	ANGLE-R	1
81	PQJHS0002Z	THERMAL HEAD S	1
82	PQJS15R78X	CONNECTOR, 15P	1
83	PQHX10080Z	INSULATOR SHEET-A	1
84	PQMD10009Z	FRAME, THERMAL HEAD	1
85	PQDF10003Z	SHAFT	1
86	PQMH10044Z	SPACER	1
87	PQMH10045Z	SPACER	1
		(3. UPPER BODY SECTION)	
100	PQKK10010Y2	CASSETTE LID	1
101	PQHX10092Z	SHEET	2
102	PQKM10035Z2	CABINET BODY, HANDSET	1
103	PQHR576Z	TRANSPARENT PLATE, TEL. CARD	1
104	PQHP532X	CARD, TEL. (SMALL)	1
105	PQAS5P13Z	SPEAKER	1
106	PQJS02R70Z	CONNECTOR, 2P	2
107	PQBH10006Y2	BUTTON, HOOK	1
108	PQBD10015Y2	KNOB, OPEN	2
109	PQHG556Z	RUBBER PARTS, MIC COVER	1
110	PQJM128Z	BUILTIN-MICROPHONE	1
111	PQBD10014Z3	KNOB, VOLUME	1
112	PQDE10007Z	LEVER, OPEN/CLOSE SENSOR	1
113	PQDG10004Z	GEAR, RECORDING ROLLER	1
114	PQDJ10001Z	SPACER, ROLLER	2
115	PQDN10001Z	ROLLER, RECORDING PAPER	1
116	PQKR10004X2	GUIDE, RECORDING PAPER	1
117	PQKM10034S2	CABINET BODY	1
118	PQQT10383Z	INDICATION LABEL	1
119	PQUS10027Z	SPRING, BACK TENSION	1
120	PQHR10066Z	SPACER	1

Ref. No.	Part No.	Part Name & Description	Pcs
121	Not Used		
122	PQDX10005Y	PAPER CUTTER ASS'Y	1
123	PQHX10208Z	SHEET, PAPER CUTTER	1
124	PQQT4337Z	CAUTION LABEL	1
125	PQNW500U	WASHER	2
126	PQGT10431Z	NAME PLATE	1
		(4. LOWER BODY SECTION)	
131	PQST1B02Z	SWITCH, POWER ⚠	1
132	PQJS2L94Z	CONNECTOR, 2P	1
133	PQJP03S07Z	AC INLET ⚠	1
134	PQKV10008Z2	COVER, FRONT	1
135	PQJQ10005Z	RX MOTOR	1
136	PQUA10002Z	CHASSIS-J, GEAR	1
137	PQJS05R66Z	CONNECTOR, 5P	1
138	PQDG10003Z	GEAR-B, MIDDLE	3
139	PQDG10002Z	GEAR-A, MIDDLE	2
140	PQDE10001Z	LEVER-JL	1
141	PQDE10008Z	LEVER, RECORDING PAPER SENSOR	1
142	PQMD10005Z	ANGLE-J	1
143	PQUS10017Z	SPRING-J	1
144	PQDE10002Z	LEVER-JR	1
145	PQDE10003Z	LEVER-SL	1
146	PQMD10006Y	ANGLE-S	1
147	PQDE10004Z	LEVER-SR	1
148	PQUS10018Z	SPRING-S	1
149	PQDN10002Z	ROLLER, SEPARATION	1
150	PQDJ10002Z	SPACER, ROLLER	6
151	PQUS10014Z	SPRING, SEPARATION ROLLER	1
152	XUC2FY	RETAINING RING	1
153	PQDG10006Z	GEAR, SEPARATION ROLLER	1
154	PQDG10005Z	GEAR, FEED ROLLER	2
155	PQDN10003Z	ROLLER, DOCUMENT FEED	2
156	PQHG10065Z	RUBBER FOOT	4
157	PQHM171Z	LID, ROM CHANGE	1
158	PQMD10012Y	FRAME, BOTTOM	1
159	PQJS05R67Y	CONNECTOR, 5P	1
160	PQJQ10004Z	TX MOTOR	1
161	PQUA10001Z	CHASSIS-S, GEAR	1
162	PQHX10081X	INSULATOR SHEET-B	1
163	PQMD10011Y	CHASSIS, POWER SUPPLY BOARD	1
164	PQHR10139Z	COVER	1
165	PQHR136Z	CLAMPER	4
166, 167	Not Used		
168	PQHX10082Z	INSULATOR SHEET-C	1
		(5. CCD UNIT SECTION)	
200	PQ0G10001Z	GLASS	1
201	PQUA10003Z	CHASSIS	1
202	PQVDKMK02A30	LED ARRAY	1
203	PQMD10013Z	ANGLE	1
204	PQ0M10002Z	MIRROR-2	1
205	PQ0M10001Z	MIRROR-1	1
206	PQ0M10003Z	MIRROR-3	1
207	PQUS272Z	SPRING-B, MIRROR	2
208	PQUS216Z	SPRING-A, MIRROR	4
209	PQHR9725Z	SPACER	1
210	PQUV10003Z	COVER	1
211	PQ0L6Y	LENS	1
212	PQUS217Z	SPRING, LENS	1
		(6. CASSETTE DECK SECTION)	
M1	PQFM9909Z	MOTOR ASS'Y	1
M2	PQFD9913Z	PINCH ROLLER ASS'Y	1
M3	PQFF9909Y	FLYWHEEL ASS'Y	1
M3-1	PQFN35Z	WASHER-C	1
M4	PQFG9904Z	GEAR ASS'Y	1
M4-1	PQFN48Z	WASHER-D	1
M5	PQFR9912Z	TAKEUP REEL TABLE ASS'Y	1
M6	PQFR9913Z	SUPPLY REEL TABLE ASS'Y	1

Ref. No.	Part No.	Part Name & Description	Pcs
M7	PQFD82Y	HEAD BASE PLATE	1
M8	PQFW42Y	HEAD BASE	1
M9	PQFS73Z	SPRING, RECORD/PLAYBACK HEAD	1
M10	PQJH1M2X	HEAD, RECORD/PLAYBACK	1
M11	PQJH6M2Z	HEAD, ERASE	1
M12	PQFS109Z	SPRING, PINCH ROLLER	1
M13	PQFS110Z	SPRING, HEAD PLATE	1
M14	PQFJ2Z	TERMINAL	1
M15	PQFC9909W	CHASSIS ASS'Y	1
M16	PQFI14Z	RUBBER PARTS, MOTOR SPACER	2
M17	PQUP589Y	P. C. BOARD, REED SWITCH	1
M18	PQJS9B30Z	CONNECTOR, 9P	1
M19	PQFN33Z	WASHER (FOR OIL CUT)	2
M20	PQFB12Z	BELT	1
M21	PQFD64Z	PLATE SPRING	1
M22	PQFS82Z	SPRING, REEL TABLE	2
M23	PQFP126Y	PLUNGER	1
M24	PQHD15Z	SCREW	2
M25	PQFN49Z	WASHER (FOR LOCK OF FLYWHEEL)	1
M26	PQSE91Z	REED SWITCH	1
M27	ERDS2TJ563	RESISTOR, 56KΩ	1
		ACCESSORIES AND PACKING MATERIALS	
A1	PQJA59V	CORD, TEL. ⚠S	1
A2	PQJA223Z	CORD, AC ⚠	1
A3	PQJA212N	CORD, HANDSET	1
A4	RT-N30-JT1P	MICRO CASETTE TAPE	1
A5	PQDJ10003Z	SPACER, RECORDING PAPER	2
A6	PQHP10023Z	RECORDING PAPER	1
A7	PQQX10327Z	INSTRUCTION BOOK	1
A8	PQQW10218Y	INSTRUCTION BOOK (QUICK REFERENCE) (ENGLISH)	1
A9, 10	Not Used		
A11	PQQW10110Z	CARD, DIAL	1
A12	PQPP10005Z	PROTECTION COVER (DOCUMENT)	1
A13	XZB20X20A04	PROTECTION COVER (CORD)	1
A14	PQJX2PFA409Z	HANDSET	1
A15	PQPH92Z	PROTECTION COVER (UNIT)	1
A16	PQUS230X	SPRING	1
A17	PQKE10008Z2	STACKER	1
A18	PQPH106Z	PROTECTION COVER (STACKER)	1
A19	XZB10X28A04	PROTECTION COVER (SPRING)	1
P1	PQPK10354Y	GIFT BOX	1
P2	PQPN10102Z	ACCESSORY BOX	1
P3	PQPN10118X	CUSHION-L/R (COMPLETE)	1
P4	PQPN935Z	HANDLE	1
P5	PQPN10182Z	PAD	1
		DIGITAL BOARD PARTS	
PCB1	PQWP1F230M	DIGITAL BOARD ASS'Y (RTL)	1
		(ICs)	
IC1	PQVIZ8400L8V	IC	1
IC2	PQWIF230M	IC	1
IC3	PQVIC58257CL	IC	1
IC4	PQVIMS6242BS	IC	1
IC5	PQVIR96DFX	IC	1
IC6	PQVIE58R72F	IC	1
IC7	MN4464S08LL	IC S	1
IC8	PQVISN7H244S	IC	1
IC9	PQVIPD7H245G	IC S	1
IC10	PQVIMM1045BF	IC	1
IC11	PQVIMS8C5A2G	IC S	1
IC12	PQVILC89066M	IC	1
IC13	PQVINJM2901M	IC	1
IC14	PQVINJM082BM	IC	1
IC15	PQVINJM082BM	IC	1
IC16	PQVINJM4558M	IC	1
IC17	PQVITC4053BF	IC	1
IC18	PQVINJM4558M	IC	1
IC19	PQVIBA12003	IC S	1

Ref. No.	Part No.	Part Name & Description		Pcs
IC20	PQVIBA12003	IC	S	1
IC21	PQVIM7H04F	IC	S	1
IC22	PQVITC7S00FL	IC	S	1
		(TRANSISTORS)		
Q1, 2	2SB1322	TRANSISTOR(SI) (or 2SB1237R)		2
Q3, 4	2SB1240AR	TRANSISTOR(SI)		2
Q6	2SD1819A	TRANSISTOR(SI) (or 2SC4155R)	S	1
Q7	2SB1218A	TRANSISTOR(SI)		1
		(or 2SA1576R/2SA1603R)	S	
Q8-11	2SD1819A	TRANSISTOR(SI) (or 2SC4155R)	S	4
Q12	2SD1994A	TRANSISTOR(SI)		1
Q14	PQVTDTC114EU	TRANSISTOR(SI) (or UN5211)		1
		(DIODES)		
D1	MA4051	DIODE(SI)		1
D2	1SS120	DIODE(SI) (or 1SS131)		1
D3	1SS120	DIODE(SI) (or 1SS131)		1
D4	1SS120	DIODE(SI) (or 1SS131)		1
D5	1SS147	DIODE(SI)		1
D6	1SS147	DIODE(SI)		1
D7	PQVD1SR354A	DIODE(SI)		1
D8	MA4270	DIODE(SI)		1
D9	MA7200	DIODE(SI)		1
D10	MA7200	DIODE(SI)		1
D11	1SS120	DIODE(SI) (or 1SS131)		1
D13	1SS120	DIODE(SI) (or 1SS131)		1
D14	1SS120	DIODE(SI) (or 1SS131)		1
D15	1SS120	DIODE(SI) (or 1SS131)		1
D16	1SS120	DIODE(SI) (or 1SS131)		1
D17	1SS120	DIODE(SI) (or 1SS131)		1
D18	1SS120	DIODE(SI) (or 1SS131)		1
D21	PQVDHZS3A1	DIODE(SI)		1
		(FILTER & COIL)		
LP1	EXCEMT220B	NOISE FILTER		1
L2	PQLQR1ET	COIL		1
		(COMPONENTS COMBINATIONS)		
RA1, 2	PQRSLD4X103J	RESISTOR ARRAY		2
		(CRYSTAL OSCILLATORS)		
X1	PQVCJ2400N9Z	CRYSTAL OSCILLATOR		1
X2	PQVCL3276N6Z	CRYSTAL OSCILLATOR		1
X3	PQVCJ1600N9Z	CRYSTAL OSCILLATOR		1
		(CAPACITORS)		
C1, 2, 3	PQCUV1E104MD	0.1		3
C4	PQCUV1H103KB	0.01		1
C5	PQCUV1H103KB	0.01		1
C6	PQCUV1E104MD	0.1		1
C7	PQCUV1E104MD	0.1		1
C8	PQCUV1E104MD	0.1		1
C9	PQCUV1E104MD	0.1		1
C10, 11	PQCUV1H180JC	18P		2
C13	PQCUV1C334ZF	0.33		1
C14	ECEA0JK221	220		1
C15	PQCUV1E104MD	0.1		1
C16	PQCUV1H390JC	39P		1
C17	PQCUV1H180JC	18P		1
C18	PQCUV1H102J	0.001		1
C19	PQCUV1E104MD	0.1		1
C20	PQCUV1E104MD	0.1	S	1
C21	PQCUV1H102J	0.001		1
C22	PQCUV1E104MD	0.1		1
C23	PQCUV1H331JC	330P		1
C24	PQCUV1E104MD	0.1	S	1
C25	PQCUV1E104MD	0.1		1
C27	ECEA0JK221	220		1
C28, 29	ECEA1CK101	100		2

Ref. No.	Part No.	Value		Pcs
C30	PQCUV1E104MD	0.1		1
C31	PQCUV1C334ZF	0.33		1
C32, 34	PQCUV1E104MD	0.1		2
C36	PQCUV1E473MD	0.047		1
C37	PQCUV1E104MD	0.1		1
C38	PQCUV1H180JC	18P		1
C39	PQCUV1H120JC	12P		1
C40	PQCUV1E104MD	0.1		1
C41	PQCUV1E104MD	0.1		1
C42	PQCUV1E104MD	0.1		1
C43	PQCUV1E104MD	0.1		1
C44	PQCUV1E104MD	0.1		1
C45	PQCUV1H103KB	0.01		1
C46-49	PQCUV1E104MD	0.1		4
C50	PQCUV1E104MD	0.1		1
C51	PQCUV1E104MD	0.1		1
C52	PQCUV1E104MD	0.1		1
C53	ECEA1VKA330	33		1
C54	ECEA1VKA330	33		1
C55	PQCUV1E104MD	0.1		1
C56	PQCUV1E104MD	0.1		1
C57	PQCUV1E104MD	0.1		1
C58	PQCUV1E104MD	0.1		1
C59	PQCUV1E104MD	0.1		1
C60	PQCUV1E104MD	0.1		1
C61	PQCUV1E104MD	0.1		1
C62	ECEA1CK101	100	S	1
C63	ECEA1CK101	100		1
C64	PQCUV1H103KB	0.01		1
C65	PQCUV1H221JC	220P		1
C66	PQCUV1H101JC	100P		1
C67	PQCUV1H103KB	0.01		1
C68	ECEA1CK101	100		1
C69	PQCUV1H682KB	0.0068		1
C70	PQCUV1H103KB	0.01		1
C71	PQCUV1E104MD	0.1		1
C72	PQCUV1H103KB	0.01		1
C75	ECEA0JK221	220		1
C76	PQCUV1E104MD	0.1		1
C77	PQCUV1E104MD	0.1		1
C78	PQCUV1H101JC	100P		1
C80	ECEA1CK101	100		1
C81	ECUV1H560JCV	56P		1
C82	ECUV1H560JCV	56P		1
C83	ECUV1H560JCV	56P		1
C84	ECUV1H560JCV	56P		1
C85	ECUV1H560JCV	56P		1
C86	ECUV1H560JCV	56P		1
C87	ECUV1H560JCV	56P		1
C88	ECUV1H560JCV	56P		1
C89	ECUV1H560JCV	56P		1
C90	ECUV1H560JCV	56P		1
C91	ECUV1H560JCV	56P		1
C92	ECUV1H560JCV	56P		1
C93	ECUV1H560JCV	56P		1
C94	ECUV1H560JCV	56P		1
C95	ECUV1H560JCV	56P		1
C96	ECUV1H560JCV	56P		1
C97	ECUV1H560JCV	56P		1
C98	ECUV1H560JCV	56P		1
C99	ECUV1H560JCV	56P		1
C100-103	ECUV1H560JCV	56P		4
C104	PQCUV1H270JC	27P		1
C106	PQCUV1H472KB	0.0047		1

Ref. No.	Part No.	Value	Pcs
		(RESISTORS)	
R1	PQ4R10XJ103	10K	1
R4, 5	PQ4R10XJ000	0	2
R6	PQ4R10XJ473	47K	1
R7	PQ4R10XJ123	12K	1
R8	ERDS2TJ3R3	3.3	1
R9	PQ4R10XJ473	47K	1
R10	PQ4R10XJ563	56K	1
R11, 12	PQ4R10XF8662	86.6K	2
R13	PQ4R10XJ683	68K	1
R14	PQ4R10XJ272	2.7K	1
R15	PQ4R10XF1002	10K	1
R16	PQ4R10XF3652	36.5K	1
R17	ERDS2TJ221	220	1
R18	PQ4R10XJ222	2.2K	1
R19	PQ4R10XJ105	1M	1
R21	PQ4R10XJ222	2.2K	1
R22	PQ4R10XJ562	5.6K	1
R23	PQ4R10XJ222	2.2K	1
R24	PQ4R10XJ152	1.5K	1
R25	PQ4R10XJ000	0	1
R26	PQ4R10XJ154	150K	1
R27	PQ4R10XJ472	4.7K	1
R29	PQ4R10XJ223	22K	1
R30	PQ4R10XJ104	100K	1
R31	PQ4R10XJ562	5.6K	1
R32	PQ4R10XJ682	6.8K	1
R33	PQ4R10XJ471	470	1
R34	PQ4R10XJ472	4.7K	1
R35	PQ4R10XJ475	4.7M	1
R36	PQ4R10XJ471	470	1
R37	PQ4R18XJ000	0	1
R38	PQ4R10XJ123	12K	1
R39	PQ4R10XJ563	56K	1
R40	PQ4R10XJ154	150K	1
R41	PQ4R10XJ562	5.6K	1
R42, 43	PQ4R10XJ563	56K	2
R44	PQ4R10XJ000	0	1
R45	PQ4R10XJ563	56K	1
R46	PQ4R10XJ000	0	1
R47	PQ4R10XJ563	56K	1
R48	PQ4R10XJ684	680K	1
R49	PQ4R10XJ562	5.6K	1
R50	PQ4R10XJ563	56K	1
R51	PQ4R10XJ223	22K	1
R52	PQ4R10XJ331	330	1
R53	PQ4R10XJ563	56K	1
R54	PQ4R10XJ000	0	1
R55	PQ4R10XJ563	56K	1
R56	PQ4R10XJ682	6.8K	1
R57	PQ4R10XJ473	47K	1
R58	ERDS2TJ122	1.2K	1
R59	ERDS2TJ562	5.6K	1
R62	PQ4R10XJ563	56K	1
R63	PQ4R10XJ562	5.6K	1
R65	PQ4R10XJ563	56K	1
R66	PQ4R10XJ562	5.6K	1
R67, 68	PQ4R10XJ563	56K	2
R69	PQ4R10XJ562	5.6K	1
R70, 71	PQ4R10XJ183	18K	2
R73-80	PQ4R10XJ101	100	8
R81	ERDS2TJ222	2.2K	1
R82	PQ4R10XJ821	820	1
R83	ERDS2TJ222	2.2K	1
R84	PQ4R10XJ821	820	1
R85	PQ4R10XJ222	2.2K	1

Ref. No.	Part No.	Part Name & Description	Pcs
R86	PQ4R10XJ103	10K	1
R87	PQ4R10XJ332	3.3K	1
R88	PQ4R10XJ332	3.3K	1
R89	ERDS2TJ561	560	1
R90	PQ4R10XJ222	2.2K	1
R91	ERDS2TJ331	330	1
R92	PQ4R10XJ103	10K	1
R93	PQ4R10XJ472	4.7K	1
R94	PQ4R10XJ222	2.2K	1
R95	PQ4R10XJ103	10K	1
R96	PQ4R10XJ682	6.8K	1
R97	PQ4R10XJ332	3.3K	1
R98	PQ4R10XJ182	1.8K	1
R99	PQ4R10XJ472	4.7K	1
R100	PQ4R10XJ103	10K	1
R101	PQ4R10XJ391	390	1
R102	PQ4R10XJ103	10K	
R103	ER016CKF1201	1.2K	1
R104	ER016CKF1801	1.8K	1
R105	ER016CKF1501	1.5K	1
R106	PQ4R10XJ272	2.7K	1
R107	PQ4R10XJ101	100	1
R108	PQ4R10XJ272	2.7K	1
R109	PQ4R10XJ102	1K	1
R110	PQ4R10XJ151	150	1
R112	PQ4R10XJ275	2.7M	1
R120	PQ4R10XJ101	100	1
R121	PQ4R10XJ563	56K	1
R122	PQ4R10XJ563	56K	1
R123	PQ4R10XJ563	56K	1
R124	PQ4R10XJ563	56K	1
R125	PQ4R10XJ563	56K	1
R126	PQ4R10XJ563	56K	1
R127	PQ4R10XJ563	56K	1
R128	PQ4R10XJ563	56K	1
R129	PQ4R10XJ472	4.7K	1
R130	PQ4R10XJ123	12K	1
R131	PQ4R10XJ101	100	1
R132	PQ4R10XJ101	100	1
R133	PQ4R10XJ101	100	1
R134	PQ4R10XJ221	220	1
R135	PQ4R10XJ101	100	1
R137	PQ4R10XJ101	100	1
R147	ERDS2TJ681	680	1
R148	PQ4R18XJ821	820	1
R149	PQ4R18XJ821	820	1
R150	PQ4R18XJ470	47	1
R151	PQ4R10XJ100	10	1
R153	PQ4R10XJ101	100	1
R154	PQ4R10XJ562	5.6K	1
R155	ERDS2TJ102	1K	1
		(BATTERY & CONNECTORS)	
BA1	PQPCR2032H09	LITHIUM BATTERY	1
CN1	PQJP11A19Z	CONNECTOR, 11P	1
CN2	PQJP11A19Z	CONNECTOR, 11P	1
CN3	PQJP12A22Z	CONNECTOR, 12P	1
CN4	PQJP11A19Z	CONNECTOR, 11P	1
CN5	PQJP08G100Z	CONNECTOR, 8P	1
CN6	PQJP09G100Z	CONNECTOR, 9P	1
CN7	PQJP02G100Z	CONNECTOR, 2P	1
CN8, 9	PQJP05G100Z	CONNECTOR, 5P	2
CN10	PQJP4D94Z	CONNECTOR, 4P	1
CN11	PQJP3D94Z	CONNECTOR, 3P	1
CN13	PQJP03G100Z	CONNECTOR, 3P	1
CN14	PQJP08A22Z	CONNECTOR, 8P	1

Ref. No.	Part No.	Part Name & Description		Pcs
		ANALOG BOARD PARTS		
PCB2	PQLP10002M	ANALOG BOARD ASSY (RTL)		1
		(ICs)		
IC1	PQVISC79054A	IC		1
IC2	PQVINJM4558D	IC	S	1
IC3	PQVIMT3274AE	IC	S	1
IC4	PQVINJM4558M	IC		1
IC6	PQVITC4066BF	IC		1
IC7	PQVITAD001M1	IC		1
IC8	PQVINJM4558D	IC	S	1
IC9	PQVITC4066BF	IC		1
IC10	PQVINJ4053BM	IC		1
IC11	AN6181NK	IC		1
IC12	PQVIBA6220	IC		1
IC13	PQVINJM4558M	IC		1
IC14	PQVINJM4558D	IC	S	1
IC15	PQVI672191F	IC	S	1
IC16	PQVINJM4558M	IC		1
		(TRANSISTORS)		
Q1	2SA1627	TRANSISTOR(SI)		1
Q2	2SD1819A	TRANSISTOR(SI) (or 2SC4155R)	S	1
Q3	2SC2235	TRANSISTOR(SI)		1
Q6	PQVTDTC143E	TRANSISTOR(SI) (or UN521L)	S	1
Q10	PQVTDTC143E	TRANSISTOR(SI) (or UN521L)	S	1
Q11	PQVTDTC143E	TRANSISTOR(SI) (or UN521L)	S	1
Q14	2SB1218A	TRANSISTOR(SI)		1
		(or 2SA1576R, 2SA1602F, 2SA1603R)	S	
Q15	2SD1819A	TRANSISTOR(SI) (or 2SC4155R)	S	1
Q16	2SD1994A	TRANSISTOR(SI)		1
Q17	2SD1819A	TRANSISTOR(SI) (or 2SC4155R)	S	1
Q18	2SD1819A	TRANSISTOR(SI) (or 2SC4155R)	S	1
Q19	PQVTDTC143E	TRANSISTOR(SI) (or UN521L)	S	1
Q20	2SD1994A	TRANSISTOR(SI)		1
Q21	2SB1322	TRANSISTOR(SI) (or 2SB1237R)	S	1
Q22	2SB1322	TRANSISTOR(SI) (or 2SB1237R)	S	1
Q23	2SC1740S	TRANSISTOR(SI)		1
Q24	2SC1652	TRANSISTOR(SI)		1
Q25	2SC1652	TRANSISTOR(SI)		1
Q26	2SB1322	TRANSISTOR(SI) (or 2SB1237R)	S	1
Q27	2SB1322	TRANSISTOR(SI) (or 2SB1237R)	S	1
Q28	PQVTDTC143E	TRANSISTOR(SI) (or UN521L)	S	1
Q29	2SD1994A	TRANSISTOR(SI)		1
Q30	PQVTDTC143E	TRANSISTOR(SI) (or UN521L)	S	1
Q31	2SD2136	TRANSISTOR(SI)		1
		(DIODES)		
D1	MA4150	DIODE(SI)		1
D2	1SS131	DIODE(SI)		1
D3	PQVDHZS2B1	DIODE(SI)		1
D4	PQVDHZS2B1	DIODE(SI)		1
D8	1SS131	DIODE(SI)		1
D11	PQVDHZS2B1	DIODE(SI)		1
D14	1SS131	DIODE(SI)		1
D15	1SS131	DIODE(SI)		1
D16, 17	MA4056	DIODE(SI)		2
D18	MA4068	DIODE(SI)		1
D25, 26 ,28, 29	1SS131	DIODE(SI)		4
D30	PQVDS1YB40F1	DIODE(SI)		1

Ref. No.	Part No.	Part Name & Description		Pcs
		(COILS)		
L1	PQLE106	COIL	S	1
L2	PQLE106	COIL	S	1
L3	PQLE106	COIL	S	1
L4	PQLE106	COIL	S	1
L11, 12	PQLQR1ET	COIL (FERRITE BEAD)		2
		(PHOTO ELECTRIC TRANSDUCERS)		
PC1	PQVIPC814K	PHOTO COUPLER	⚠	1
PC2	PQVIPC817CD	PHOTO COUPLER	⚠	1
PC3	PQVIPC817CD	PHOTO COUPLER	⚠	1
PC4	PQVITLP627	PHOTO COUPLER	⚠S	1
		(RELAY)		
RLY1	PQSL135Z	RELAY		1
		(VARISTORS)		
SA1	PQVDRA311PT2	VARISTOR (SURGE ABSORBER)		1
SA2	PQVDDSA102MS	VARISTOR (SURGE ABSORBER)		1
		(SWITCHES)		
S1	PQSS2A27Z	SWITCH, DIALING MODE		1
S2	ESE14A211	SWITCH, HOOK		1
S3	PQSS3A17Z	SWITCH, RINGER		1
S4	ESE14A211	SWITCH, COVER		1
S5	PQSS3A17Z	SWITCH, HANDSET VOLUME		1
		(TRANSFORMERS)		
T1	ETA14Y180AY	TRANSFORMER	⚠S	1
T2	PQLT8F5A	TRANSFORMER	⚠	1
		(VARIABLE RESISTORS)		
VR2	EVNDXAA03B52	SEMI-FIXED RESISTOR, 500Ω (B)		1
VR3	EWAUCCT50625	VARIABLE RESISTOR, VOLUME		1
		(CERAMIC RESONATOR)		
X3	PQVBT4.19G2	CERAMIC RESONATOR		1
		(CAPACITORS)		
C1	ECQE2E224JZ	0.22		1
C2	PQCUV1H103KB	0.01		1
C3	ECEA1AU221	220	S	1
C4, 5	PQCUV1H103KB	0.01		2
C6, 7	ECKD2H681KB	680P		2
C9	PQCUV1H102J	0.001		1
C10	PQCUV1H103KB	0.01		1
C11	PQCUV1C683MD	0.068		1
C12	ECEA1HKS100	10		1
C13	PQCUV1C683MD	0.068		1
C14	PQCUV1H392KB	0.0039		1
C15	PQCUV1H121JC	120P		1
C16	PQCUV1C683MD	0.068		1
C17	PQCUV1H392KB	0.0039		1
C18, 19	PQCUV1E333MD	0.033		2
C20	PQCUV1H470JC	47P		1
C21	PQCUV1C683MD	0.068		1
C22	ECEA1HKS4R7	4.7		1
C23	PQCUV1H102J	0.001		1
C24	PQCUV1H470JC	47P		1
C25	PQCUV1H103KB	0.01		1
C26	ECEA0JU102	1000		1
C28	PQCUV1H103KB	0.01		1
C29	PQCUV1E104MD	0.1	S	1
C30	PQCUV1E104MD	0.1		1
C31	ECEA1EU470	47	S	1
C32	ECEA1HKS4R7	4.7		1

Ref. No.	Part No.	Value		Pcs
C33	PQCUV1H272KB	0.0027		1
C34	PQCUV1E104MD	0.1	S	1
C35	ECEA1HKS010	1		1
C36	ECEA1HKS010	1		1
C37	PQCUV1E104MD	0.1	S	1
C38	PQCUV1E104MD	0.1	S	1
C39	ECEA1CKS470	47	S	1
C40	ECEA1HKS2R2	2.2		1
C41	PQCUV1H561JC	560P		1
C42	PQCUV1E333MD	0.033		1
C43	ECEA1HKSR22	0.22		1
C44	PQCUV1H103KB	0.01		1
C45	PQCUV1H222KB	0.0022		1
C46	PQCUV1H221JC	220P		1
C47	PQCUV1C683MD	0.068		1
C48	ECEA1HKS010	1		1
C49	PQCUV1E333MD	0.033		1
C50	ECEA1CK101	100		1
C51	ECEA1CKS100	10		1
C52, 53, 54	PQCUV1H103KB	0.01		3
C55	ECEA1AU101	100	S	1
C56	PQCUV1H153KB	0.015		1
C57	PQCUV1H472KB	0.0047		1
C58	PQCUV1C683MD	0.068		1
C60	ECQE2E104KZ	0.1		1
C61	PQCUV1H472KB	0.0047		1
C62, 63	PQCUV1C683MD	0.068		2
C64	PQCUV1H562KB	0.0056		1
C65	ECEA1AU221	220	S	1
C66	PQCUV1E104MD	0.1		1
C67	PQCUV1C683MD	0.068		1
C68	PQCUV1E333MD	0.033		1
C69	ECEA1HNR47S	0.47		1
C70	PQCUV1H103KB	0.01		1
C72	ECEA1EU101	100	S	1
C73	PQCUV1C683MD	0.068		1
C74	ECEA1CU221	220		1
C75	PQCUV1C683MD	0.068		1
C76	ECEA1AU101	100	S	1
C77	PQCUV1E104MD	0.1		1
C79	ECEA1HKSR47	0.47		1
C80, 81	PQCUV1H103KB	0.01		2
C82	ECEA1HKS010	1		1
C83	Not Used			
C84, 85	PQCUV1H103KB	0.01		2
C86	PQCUV1H681JC	680P		1
C87	PQCUV1C683MD	0.068		1
C88	ECEA0JU331	330		1
C90	ECEA0JK221	220		1
C91	PQCUV1H103KB	0.01		1
C92	PQCUV1H221JC	220P		1
C93	ECEA1HKS010	1		1
C94	PQCUV1C683MD	0.068		1
C95	ECEA1AU101	100	S	1
C96	ECEA1HKSR22	0.22		1
C97	PQCUV1H223KB	0.022		1
C98	PQCUV1C683MD	0.068		1
C99	PQCUV1H103KB	0.01		1
C100	ECQG1H682JZ	0.0068	S	1
C102	ECEA1HKSR22	0.22		1
C104	PQCUV1H152KB	0.0015		1
C106	PQCUV1H103KB	0.01		1
C107	ECEA1HKS4R7	4.7		1
C108	PQCUV1E473MD	0.047		1
C109, 110	ECEA1CKS100	10		2

Ref. No.	Part No.	Value		Pcs
C111	ECEA0JKS220	22		1
C112	ECEA1HKS010	1		1
C113	PQCUV1H103KB	0.01		1
C114	ECEA1AU101	100	S	1
C115	ECHU1C682GA	0.0068		1
C116	ECQG1H682JZ	0.0068	S	1
C117	PQCUV1H103KB	0.01		1
C118	PQCUV1H331JC	330P		1
C119	PQCUV1E104MD	0.1		1
C120	PQCUV1H103KB	0.01		1
C121	ECQG1H682JZ	0.0068	S	1
C122	ECEA1CK101	100	S	1
C123	ECEA1HKSR22	0.22		1
C124	PQCUV1H103KB	0.01		1
C125	PQCUV1H223KB	0.022		1
C126	ECEA1AU221	220	S	1
C127	PQCUV1C683MD	0.068		1
C128	ECEA1AU101	100	S	1
C130	ECEA1AU221	220	S	1
C131	ECEA1HKS4R7	4.7		1
C132	PQCUV1E333MD	0.033		1
C133	ECEA1EU101	100	S	1
C135	PQCUV1H332KB	0.0033		1
C137	PQCUV1H103KB	0.01		1
C139	PQCUV1E104MD	0.1		1
C140	ECEA1AU101	100	S	1
C141	PQCUV1H103KB	0.01		1
C142	ECEA1AU101	100	S	1
C143	PQCUV1H103KB	0.01		1
C144	PQCUV1H682KB	0.0068		1
C145	PQCUV1H103KB	0.01		1
C146	PQCUV1C683MD	0.068		1
C148, 149	PQCUV1H103KB	0.01		2
C151	PQCUV1H332KB	0.0033		1
C153	PQCUV1E104MD	0.1		1
C155	ECEA1CK101	100		1
C1000	ECUX1E223MB	0.022		1
		(RESISTORS)		
J12	PQ4R10XJ000	0		1
J150, 151, 152	PQ4R18XJ000	0		3
J158	PQ4R10XJ000	0		1
J171	Not Used			
J173	PQ4R10XJ000	0		1
J174	PQ4R10XJ000	0		1
J178	PQ4R10XJ000	0		1
J179	PQ4R10XJ000	0		1
J180	PQ4R10XJ000	0		1
J181	PQ4R10XJ000	0		1
J182	PQ4R18XJ000	0		1
J183	PQ4R10XJ000	0		1
J184	PQ4R10XJ000	0		1
J185	PQ4R10XJ000	0		1
J186	PQ4R10XJ000	0		1
J188	PQ4R10XJ000	0		1
J189	PQ4R10XJ000	0		1
J190	PQ4R10XJ000	0		1
J191	PQ4R10XJ000	0		1
J196	PQ4R10XJ000	0		1
J197	PQ4R10XJ000	0		1
J200	PQ4R10XJ000	0		1
J202	PQ4R10XJ000	0		1
J203	PQ4R10XJ000	0		1

Ref. No.	Part No.	Value	Pcs
J204	PQ4R10XJ000	0	1
J205	PQ4R10XJ000	0	1
J206	PQ4R10XJ000	0	1
J207	PQ4R10XJ000	0	1
J208	PQ4R10XJ000	0	1
J209	PQ4R10XJ000	0	1
J210	PQ4R10XJ000	0	1
J212	PQ4R10XJ000	0	1
J213	PQ4R10XJ000	0	1
J214	PQ4R10XJ000	0	1
J215	PQ4R10XJ000	0	1
J217	PQ4R18XJ000	0	1
J218	PQ4R10XJ000	0	1
J234	PQ4R10XJ000	0	1
J235	PQ4R10XJ000	0	1
J236	PQ4R10XJ000	0	1
J274	PQ4R10XJ000	0	1
J275	PQ4R10XJ000	0	1
J276	Not Used		
J278	PQ4R10XJ000	0	1
J280	PQ4R10XJ000	0	1
R1	ERD25TJ473	47K	1
R2	ERDS2TJ101	100	1
R3	PQ4R10XJ152	1.5K	1
R4	PQ4R10XJ152	1.5K	1
R5	PQ4R10XJ153	15K	1
R6	PQ4R10XJ153	15K	1
R7	PQ4R18XJ473	47K	1
R8	PQ4R10XJ153	15K	1
R9	PQ4R10XJ104	100K	1
R10	ERDS2TJ472	4.7K	1
R11	PQ4R10XJ153	15K	1
R12	PQ4R10XJ564	560K	1
R13	PQ4R10XJ102	1K	1
R14	PQ4R10XJ105	1M	1
R15	PQ4R10XJ275	2.7M	1
R16	PQ4R10XJ103	10K	1
R17	PQ4R10XJ472	4.7K	1
R18	PQ4R18XJ562	5.6K	1
R19	ERD25TJ564	560K	1
R20	PQ4R10XJ271	270	1
R21	ERDS2TJ182	1.8K	1
R22	PQ4R10XJ104	100K	1
R23, 24, 25	PQ4R10XJ473	47K	3
R26	ER016CKF5360	536	1
R27	PQ4R10XJ102	1K	1
R28	PQ4R10XJ272	2.7K	1
R29	PQ4R10XJ102	1K	1
R30	PQ4R18XJ4R7	4.7	1
R31	PQ4R10XJ104	100K	1
R32	ER016CKF2201	2.2K	1
R33	PQ4R10XJ154	150K	1
R34, 35	PQ4R10XJ104	100K	2
R36	ER016CKF2201	2.2K	1
R37	ER016CKF6190	619	1
R38	ERDS2TJ104	100K	1
R39	PQ4R10XJ334	330K	1
R40	PQ4R10XJ223	22K	1
R41	PQ4R10XJ683	68K	1
R42	PQ4R10XJ104	100K	1
R43	PQ4R10XJ392	3.9K	1
R44	PQ4R10XJ684	680K	1
R45	PQ4R10XJ273	27K	1
R46	PQ4R10XJ683	68K	1
R47	PQ4R10XJ682	6.8K	1

Ref. No.	Part No.	Value	Pcs
R48	PQ4R10XJ124	120K	1
R49	ERDS2TJ473	47K	1
R50	PQ4R10XJ103	10K	1
R51	PQ4R10XJ822	8.2K	1
R52	PQ4R10XJ393	39K	1
R53	PQ4R10XJ682	6.8K	1
R54	PQ4R10XJ103	10K	1
R55	PQ4R10XJ472	4.7K	1
R56	ERDS1TJ153	15K	1
R57	PQ4R10XJ103	10K	1
R58	PQ4R10XJ000	0	1
R59	PQ4R10XJ473	47K	1
R60	PQ4R10XJ101	100	1
R61	PQ4R10XJ100	10	1
R62	PQ4R18XJ103	10K	1
R63	PQ4R10XJ222	2.2K	1
R64	PQ4R10XJ222	2.2K	1
R65	PQ4R10XJ222	2.2K	1
R66	PQ4R10XJ564	560K	1
R67	PQ4R10XJ105	1M	1
R68	PQ4R10XJ682	6.8K	1
R69	PQ4R10XJ335	3.3M	1
R70	PQ4R10XJ185	1.8M	1
R71	PQ4R10XJ474	470K	1
R72	PQ4R10XJ683	68K	1
R73	PQ4R10XJ104	100K	1
R74	PQ4R10XJ475	4.7M	1
R75	PQ4R18XJ122	1.2K	1
R76	PQ4R10XJ183	18K	1
R77	PQ4R10XJ473	47K	1
R78	Not Used		
R79	PQ4R10XJ222	2.2K	1
R80	PQ4R18XJ124	120K	1
R83	PQ4R10XJ223	22K	1
R85	ERD25TJ223	22K	1
R86	PQ4R10XJ681	680	1
R87	PQ4R10XJ103	10K	1
R88	PQ4R10XJ184	180K	1
R89	PQ4R10XJ393	39K	1
R90	PQ4R10XJ272	2.7K	1
R91	PQ4R10XJ222	2.2K	1
R92	PQ4R10XJ103	10K	1
R93	PQ4R10XJ103	10K	1
R94	ERDS2TJ391	390	1
R95	PQ4R10XJ103	10K	1
R96	PQ4R10XJ682	6.8K	1
R97	ERDS1TJ330	33	1
R98	PQ4R10XJ563	56K	1
R99	PQ4R10XJ225	2.2M	1
R100	PQ4R18XJ154	150K	1
R101	PQ4R10XJ223	22K	1
R102	ERDS2TJ5R6	5.6	1
R103	ERDS2TJ333	33K	1
R104, 105	PQ4R10XJ103	10K	2
R106	PQ4R10XJ472	4.7K	1
R107	PQ4R10XJ681	680	1
R108	ERDS2TJ120	12	1
R109	ERD25TJ103	10K	1
R110	PQ4R10XJ221	220	1
R111, 112	PQ4R10XJ473	47K	2
R113, 114	PQ4R10XJ471	470	2
R115	PQ4R10XJ473	47K	1
R116	PQ4R10XJ151	150	1
R117	PQ4R10XJ221	220	1
R118	PQ4R10XJ102	1K	1
R119	PQ4R10XJ103	10K	1

Ref. No.	Part No.	Value	Pcs
R121	PQ4R10XJ122	1.2K	1
R122	PQ4R10XJ681	680	1
R123	PQ4R10XJ394	390K	1
R124	PQ4R10XJ563	56K	1
R125	PQ4R10XJ221	220	1
R126	PQ4R10XJ183	18K	1
R127	PQ4R10XJ121	120	1
R128	PQ4R10XJ334	330K	1
R129	PQ4R10XJ222	2.2K	1
R130	PQ4R10XJ224	220K	1
R131	PQ4R10XJ104	100K	1
R132	PQ4R10XJ563	56K	1
R133	PQ4R10XJ563	56K	1
R134	PQ4R10XJ822	8.2K	1
R135	PQ4R10XJ104	100K	1
R136	PQ4R10XJ682	6.8K	1
R137	PQ4R10XJ105	1M	1
R138	PQ4R10XJ2R2	2.2	1
R139	PQ4R10XJ103	10K	1
R140	PQ4R10XJ103	10K	1
R141	PQ4R10XJ102	1K	1
R142	PQ4R10XJ103	10K	1
R143	ERD25TJ103	10K	1
R144	PQ4R10XJ473	47K	1
R145	ERDS2TJ330	33	1
R146	PQ4R10XJ473	47K	1
R147	PQ4R10XJ273	27K	1
R148	PQ4R10XJ000	0	1
R150	PQ4R10XJ392	3.9K	1
R151	PQ4R10XJ562	5.6K	1
R152	PQ4R10XJ152	1.5K	1
R153	ERDS2TJ6R8	6.8	1
R154	PQ4R10XJ474	470K	1
R155	ER016KF10641	0.64K	1
R156	ER016KF21281	1.28K	1
R157	PQ4R10XJ224	220K	1
R158	PQ4R10XJ472	4.7K	1
R159	PQ4R10XJ684	680K	1
R160	PQ4R10XJ222	2.2K	1
R161	PQ4R10XJ152	1.5K	1
R162	PQ4R10XJ393	39K	1
R163	ER016KF21281	1.28K	1
R165	PQ4R10XJ102	1K	1
R166	ERDS1TJ330	33	1
R167	PQ4R10XJ472	4.7K	1
R168	PQ4R10XJ104	100K	1
R169	PQ4R10XJ272	2.7K	1
R170	PQ4R10XJ103	10K	1
R171	PQ4R10XJ473	47K	1
R172	PQ4R10XJ101	100	1
R173	PQ4R10XJ224	220K	1
R174	PQ4R10XJ473	47K	1
R175	PQ4R10XJ564	560K	1
R176	PQ4R10XJ105	1M	1
R177	PQ4R18XJ473	47K	1
R178, 179, 180	PQ4R10XJ104	100K	3
R181	PQ4R10XJ123	12K	1
R183	PQ4R10XJ184	180K	1
R184	PQ4R10XJ124	120K	1
R186, 187	PQ4R10XJ103	10K	2
R188	PQ4R10XJ221	220	1
R189	PQ4R10XJ273	27K	1
R190	PQ4R10XJ123	12K	1
R191	PQ4R10XJ153	15K	1
R192	ERDS1TJ330	33	1
R193	PQ4R10XJ683	68K	1
R194	PQ4R10XJ153	15K	1

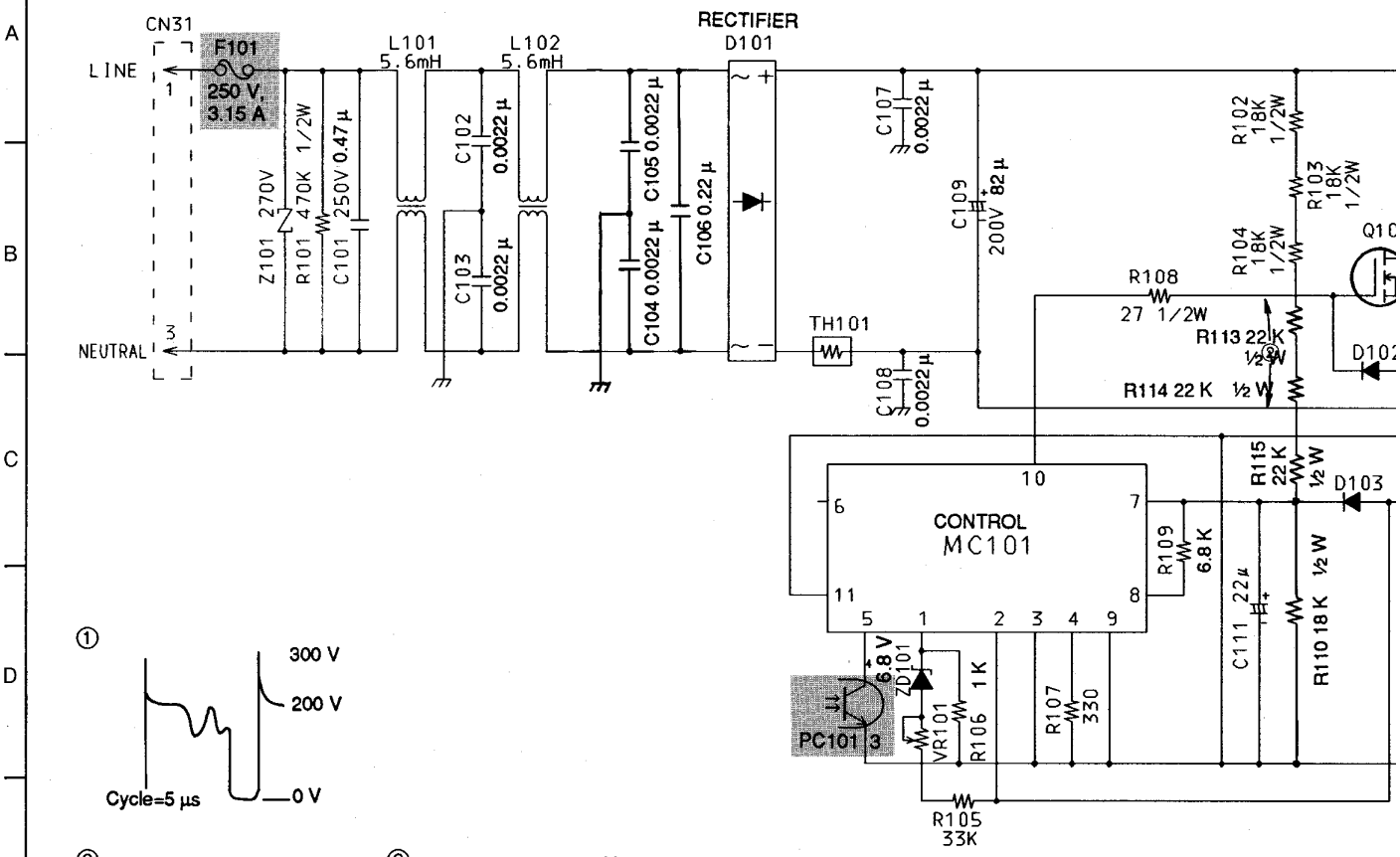
Ref. No.	Part No.	Part Name & Description		Pcs
R199	PQ4R10XJ155	1.5M		1
R200	PQ4R10XJ104	100K		1
R202	ERDS2TJ473	47K		1
R203	PQ4R10XJ103	10K		1
R204	PQ4R10XJ103	10K		1
R205	PQ4R10XJ103	10K		1
R206	PQ4R10XJ153	15K		1
		(SPACER, CONNECTORS & JACKS)		
E1	PQHR9451Y	SPACER, HOOK SWITCH		1
CN1	PQJS11A10Z	CONNECTOR, 11P		1
CN2	PQJS11A10Z	CONNECTOR, 11P		1
CN3	PQJP11A17Z	CONNECTOR, 11P		1
CN4	PQJS11A10Z	CONNECTOR, 11P		1
CN5	PQJJ2TAA2Z	JACK, TEL.		1
CN6, 7	PQJP02G100Z	CONNECTOR, 2P		2
CN8	PQJJ1TB18Z	JACK, HANDSET		1
CN9	PQJP09A18Z	CONNECTOR, 9P		1
		OPERATION AND JAM SENSOR BOARDS PARTS		
PCB3	PQLP10007M	OPERATION & JAM SENSOR BOARD ASS'Y (RTL)		1
		(IC)		
IC301	PQVI672191F	IC	S	1
		(TRANSISTORS)		
Q301-317	PQVTDTA114YU	TRANSISTOR(SI)	S	17
Q320, 321, 322	PQVTDTC114EU	TRANSISTOR(SI)	S	3
		(DIODES)		
D301, 302	1SS131	DIODE(SI) (or 1SS120)		2
D303	1SS131	DIODE(SI) (or 1SS120)		1
D304	1SS131	DIODE(SI) (or 1SS120)		1
D305	1SS131	DIODE(SI) (or 1SS120)		1
D306	1SS131	DIODE(SI) (or 1SS120)		1
D307	1SS131	DIODE(SI) (or 1SS120)		1
D308	1SS131	DIODE(SI) (or 1SS120)		1
D309	1SS131	DIODE(SI) (or 1SS120)		1
LED301	PQVDSLZ281B1	LED		1
LED302, 303	LN242RP	LED	S	2
LED304	LN342GPX	LED	S	1
LED305	LN342GPX	LED	S	1
LED306	PQVDSLZ181B1	LED		1
LED307	PQVDSLZ181B1	LED		1
LED308	PQVDSLZ281B1	LED		1
LED309	LN342GPX	LED	S	1
LED310	LN342GPX	LED	S	1
LED311	LN342GPX	LED	S	1
LED312	LN342GPX	LED	S	1
LED313	LN342GPX	LED	S	1
LED314	LN342GPX	LED	S	1
LED315	LN342GPX	LED	S	1
LED316	LN342GPX	LED	S	1
LED317	LN342GPX	LED	S	1
		(PHOTO ELECTRIC TRANSDUCERS)		
PS301	PQVISGKP01	SENSOR, DOCUMENT		1
PS302	PQVISGKP01	SENSOR, READ POSITION		1
PS303	PQVIPS6002	SENSOR, JAM		1
		(SWITCHES)		
S301-304	PQSH1A43Z	SWITCH		4
S305-308	EVQ22405K	SWITCH		4
S309-312	PQSH1A43Z	SWITCH		4
S313-316	EVQ22405K	SWITCH		4
S317-320	PQSH1A43Z	SWITCH		4
S321-353	EVQ22405K	SWITCH		33

■ **PRINTED CIRCUIT BOARD (ANALOG BOARD) (Change of original pages 175~180)**

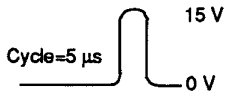
■ **SCHEMATIC DIAGRAM (ANALOG CIRCUIT) (Change of original pages 172~174)**

C83 J171 J276 R78	➡	**Deletion**
(Model KX-F230)		(Model KX-F230BX)

SCHEMATIC DIAGRAM (SWITCHING POWE



①

②


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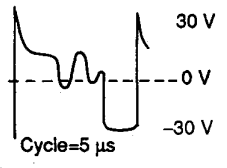

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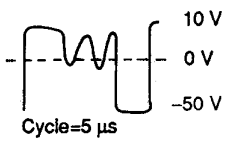

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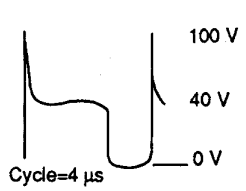
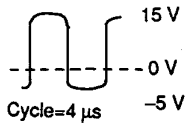


⑥


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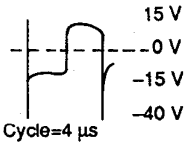

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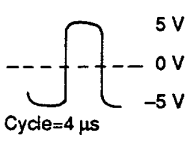

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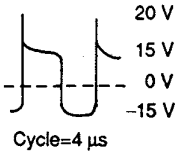

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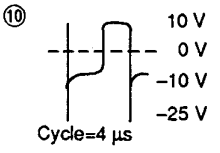
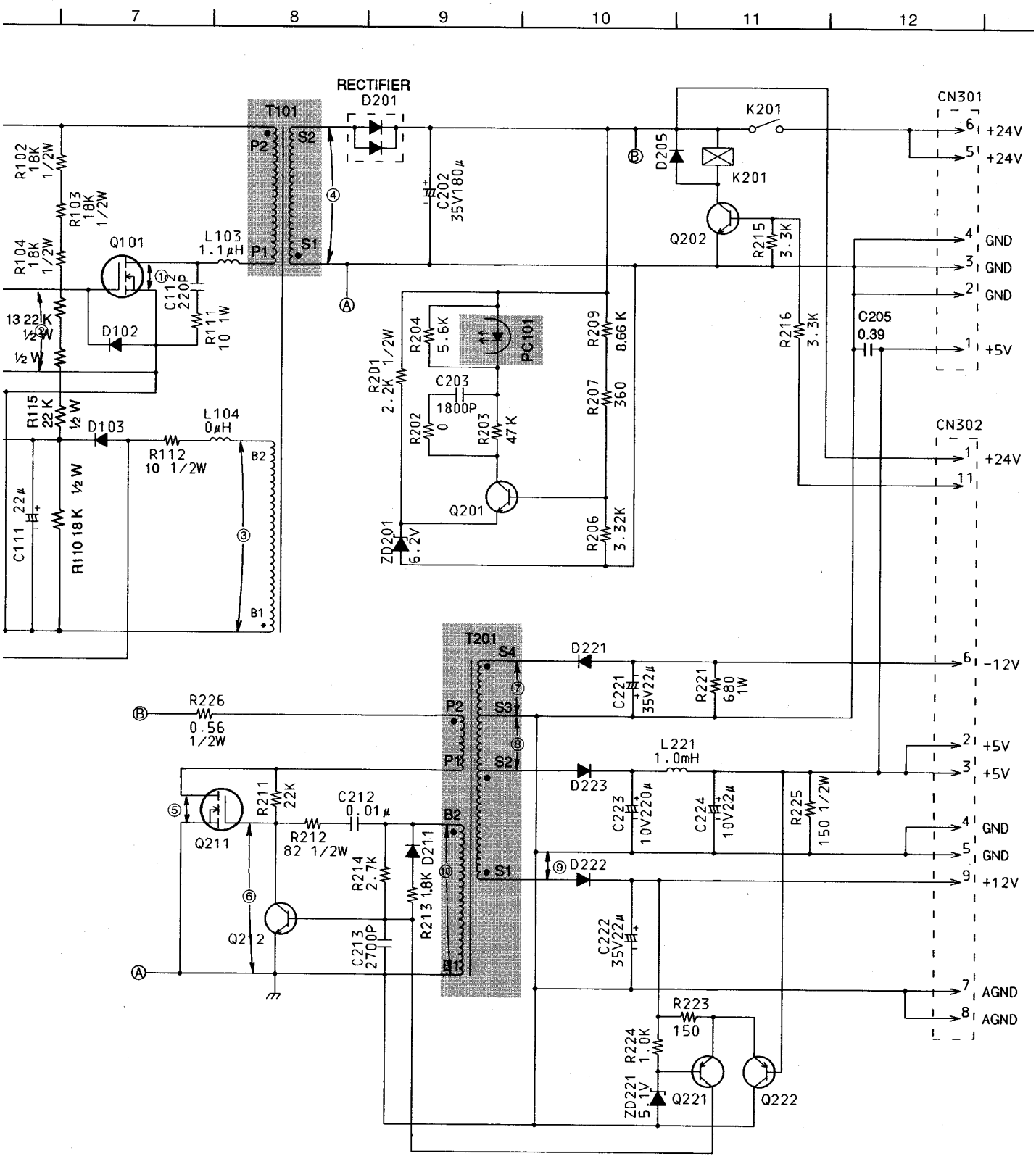


Note:
The waveforms of ①~⑩ are rated load ones.

(Model KX-

Note:
When measuring the waveform on the primary circuit of the Switching Power Supply Board, be sure to insulate the ground of the oscilloscope's probe from the ground of its power supply.

NG POWER SUPPLY) ...Change of original pages 183 and 184



(Model KX-F230BX)

Ref. No.	Part No.	Part Name & Description	Pcs
		(CAPACITORS)	
C301	PQCUV1E104MD	0.1	1
C302	PQCUV1E104MD	0.1	1
C303	PQCUV1E104MD	0.1	1
C304	PQCUV1E104MD	0.1	1
C305	PQCUV1E104MD	0.1	1
C306	ECEA0JKS101	100	1
C308	PQCUV1H102J	0.001	1
C310	PQCUV1H102J	0.001	1
		(RESISTORS)	
R301-305	PQ4R18XJ331	330	5
R306	PQ4R10XJ331	330	1
R307-311	PQ4R18XJ331	330	5
R312	PQ4R10XJ331	330	1
R313, 314, 315	PQ4R18XJ331	330	3
R316, 317	PQ4R10XJ331	330	2
R319	PQ4R10XJ103	10K	1
R320	PQ4R10XJ101	100	1
R321, 322	PQ4R18XJ103	10K	2
R323-328	PQ4R10XJ103	10K	6
R329	PQ4R10XJ331	330	1
R330	PQ4R10XJ331	330	1
R331	PQ4R10XJ101	100	1
R332	PQ4R10XJ122	1.2K	1
R333	PQ4R10XJ122	1.2K	1
R334	PQ4R10XJ103	10K	1
R335	PQ4R10XJ103	10K	1
R336, 337	PQ4R10XJ103	10K	2
		(CONNECTORS)	
CN301	PQJP12A21Z	CONNECTOR, 12P	1
CN302	PQJP08A21Z	CONNECTOR, 8P	1
CN303	PQJP14A32Z	CONNECTOR, 14P	1
CN304	PQJS03R73Z	CONNECTOR, 3P	1

SWITCHING POWER SUPPLY BOARD PARTS

PCB4	ETXA07D8E	POWER SUPPLY BOARD ASS'Y (RTL) ⚠		1
		(TRANSISTORS)		
Q101	2SK1341	TRANSISTOR(SI)		1
Q201, 202	2SC3311	TRANSISTOR(SI) (or 2SC4640)	S	2
Q211	2SK1060	TRANSISTOR(SI) (or 2SK1299, 2SK1804)	S	1
Q212	2SC1318	TRANSISTOR(SI) (or 2SC2274)	S	1
Q221, 222	2SA1309	TRANSISTOR(SI) (or 2SA1782)	S	2

Ref. No.	Part No.	Part Name & Description	Pcs
		(DIODES)	
D101	PQVDS1VBA60	DIODE(SI)	1
D102	MA165	DIODE(SI)	1
D103	PQVDAL01Z	DIODE(SI)	1
D201	MA649	DIODE(SI)	1
D205	MA165	DIODE(SI)	1
D211	MA165	DIODE(SI)	1
D221	PQVDAL01Z	DIODE(SI)	1
D222	PQVDAL01Z	DIODE(SI)	1
D223	PQVDERA81004	DIODE(SI)	1
ZD101	MA4068	DIODE(SI)	1
ZD201	MA4062	DIODE(SI)	1
ZD221	MA4051	DIODE(SI)	1
		(FUSE)	
F101	PQBA2C31TRLW	FUSE ⚠	1
		(RELAY)	
K201	PQSL138Z	RELAY	1
		(COILS & FILTER)	
L101	ELF18D290G	CHOKE COIL	1
L102	ELF18D290	CHOKE COIL	1
L103, 104	EXCELDR35	BEAD INDUCTOR	2
L221	ELEV1R0KA	CHOKE COIL	1
		(PRINTED CIRCUIT BOARD)	
MC101	ML32E1	MODULE	1
		(PHOTO ELECTRIC TRANSDUCER)	
PC101	PQVITLP634	PHOTO COUPLER ⚠	1
		(THERMISTOR)	
TH101	PQRRTH13D120	THERMISTOR	1
		(TRANSFORMERS)	
T101	ETB28BF118	TRANSFORMER ⚠	1
T201	ETB19KA15	TRANSFORMER ⚠	1
		(VARIABLE RESISTOR)	
VR101	TEASA01B54	SEMI-FIXED, 50KΩ(B)	1
		(VARISTORS)	
Z101	ERZC10DK471	VARISTOR	1
		(CAPACITORS)	
C101	ECQU2A474MV	0.47	1
C102-105 ,107, 108	ECKRNS222ME	0.0022	6
C106	ECQU2A224MN	0.22	1
C109	EC0S2GA820CA	82	1
C111	ECEA1VFS220	22	1
C112	ECKD3D331KBN	330P	1
C202	ECA1VFZ181	180P	1
C203	ECQB1H182KF	0.0018	1
C205	ECQV1H394JZ	0.039	1
C212	ECQB1H103JF	0.01	1
C213	ECQB1H272JF	0.0027	1
C221	ECEA1VFS220	22	1
C222	ECEA1VFS220	22	1
C223	ECA1AFZ221	220P	1
C224	ECEA1AGE220	22	1

Ref. No.	Part No.	Part Name & Description	Pcs
		(RESISTORS)	
R101	ERDS1TJ474	470K	1
R102, 103, 104	ERDS1TJ183	18K	3
R105	ERDS2TJ333	33K	1
R106	ERDS2TJ102	1K	1
R107	ERDS2TJ331	330	1
R108	ERG12SJU270	27	1
R109	ERDS2TJ682	6.8K	1
R110	ERDS1TJ183	18K	1
R111	ERG1SJU100	10	1
R112	ERDS1TJ100	10	1
R113, 114, 115	ERDS1TJ223	22K	3
R201	ERDS1TJ222	2.2K	1
R203	ERDS2TJ473	47K	1
R204	ERDS2TJ562	5.6K	1
R206	ER0S2TKF3321	3.32K	1
R207	ER0S2TKF3600	360	1
R209	ER0S2TKF8661	8.66K	1
R211	ERDS2TJ223	22K	1
R212	ERDS1TJ820	82	1
R213	ERDS2TJ182	1.8K	1
R214	ERDS2TJ272	2.7K	1
R215, 216	ERDS2TJ332	3.3K	2
R221	ERG1SJU681	680	1
R223	ERDS2TJ152	1.5K	1
R224	ERDS2TJ102	1K	1
R225	ERDS1TJ151	150	1
R226	ERX12SJUR56	0.56	1
		(CONNECTORS)	
CN31	PQJP2D98Z	CONNECTOR, 2P	1
CN301	PQJP6G100Z	CONNECTOR, 6P	1
CN302	PQJS11X41Z	CONNECTOR, 11P	1
		CCD BOARD PARTS	
PCB5	PQWPF150M	CCD BOARD ASS'Y (RTL)	1
		(IC)	
IC2	PQWPF150M	IC (SUPPLIED BY CCD BOARD ASS'Y)	1
		(TRANSISTORS)	
Q401, 402	2SD1819A	TRANSISTOR(SI) (or 2SC4155R) S	2
		(VARIABLE RESISTOR)	
VR401	EVNDXAA03B14	SEMI-FIXED, 10KΩ(B)	1
		(CAPACITORS)	
C401	ECA1CFQ331B	330	1
C403, 404, 405	PQCUV1E104MD	0.1	3
C406	ECEA1CKS100	10	1
		(RESISTORS)	
J401-405	PQ4R18XJ000	0	5
R401, 402	PQ4R10XJ101	100	2
R403	PQ4R10XJ331	330	1
R404	PQ4R10XJ101	100	1
R406	PQ4R10XJ470	47	1
R407	PQ4R10XJ183	18K	1
R408, 409	PQ4R10XJ272	2.7K	2
R410	PQ4R10XJ331	330	1
R411	PQ4R10XJ221	220	1
R412	PQ4R10XJ152	1.5K	1
R415	PQ4R10XJ180	18	1
		(CONNECTOR)	
CN401	PQJS08R65Y	CONNECTOR, 8P	1

Ref. No.	Part No.	Part Name & Description	Pcs
		RECORDING PAPER SENSOR BOARD PARTS	
PCB6	PQLP10009M	RECORDING PAPER SENSOR BOARD PARTS ASS'Y (RTL)	1
		(PHOTO ELECTRIC TRANSDUCER)	
PC501	PQVIPS4506	SENSOR S	1
		(RESISTOR)	
R501	ERDS2TJ331	330	1
		(CONNECTOR)	
CN501	PQJS03R68Y	CONNECTOR, 3P	1
		LCD BOARD PARTS	
PCB7	PQLP10004M	LCD BOARD ASS'Y (RTL)	1
		(ICs)	
IC701	PQVIHD66702A	IC	1
		(CAPACITORS)	
C701	PQCUV1E104MD	0.1	1
C702	PQCUV1E104MD	0.1	1
		(RESISTORS)	
R702	PQ4R10XJ683	68K	1
R703	PQ4R10XJ222	2.2K	1
R704	PQ4R10XJ222	2.2K	1
R705	PQ4R10XJ222	2.2K	1
R706	PQ4R10XJ222	2.2K	1
R707	PQ4R10XJ222	2.2K	1
		(OTHERS)	
LCD	PQADCG957TS	LCD	1
E700	PQHR10103Z	LCD GUIDE	1
E701	PQJG10007Z	CONNECTOR	2
CN701	PQJS14X49Z	CONNECTOR, 14P	1
		FIXTURES AND TOOL	
EC1	PQZZ2K12Z	EXTENSION CORD, 2P	3
EC2	PQZZ2K13Z	EXTENSION CORD, 2P	1
EC3	PQZZ3K12Z	EXTENSION CORD, 3P	1
EC4	PQZZ5K6Z	EXTENSION CORD, 5P	2
EC5	PQZZ6K14Z	EXTENSION CORD, 6P	1
EC6	PQZZ8K15Z	EXTENSION CORD, 8P	1
EC7	PQZZ9K7Z	EXTENSION CORD, 9P	1
EC8	PQJS9K2Y	EXTENSION CORD, 9P	1
EC9	PQZZ12K8Z	EXTENSION CORD, 12P	1
EC10	PQJS11K3Z	EXTENSION CORD, 11P	1
EC11	PQZZ11K8Z	EXTENSION CORD, 11P	3
EC12	PQZZ4K6Z	EXTENSION CORD, 4P	1
EC13	PQZZ3K11Z	EXTENSION CORD, 3P	1
EC14	PQZZ8K16Z	EXTENSION CORD, 8P	1
	QZZMWA or PQZZLCT2401A	TEST TAPE (Refer to page 87.)	1
CT	PQZZF150M	CCD TOOL	1
		Notes: 1. CCD Tool, Test Tape and Extension Cords (Ref. No. EC1, EC2, EC5, EC6, EC10) are necessities for servicing. 2. Extension Cords (Ref. No. EC3, EC4, EC7, EC8, EC9, EC11-14) are useful for servicing. (They make servicing easy.)	

ORDER NO. KM49301413C1
F7

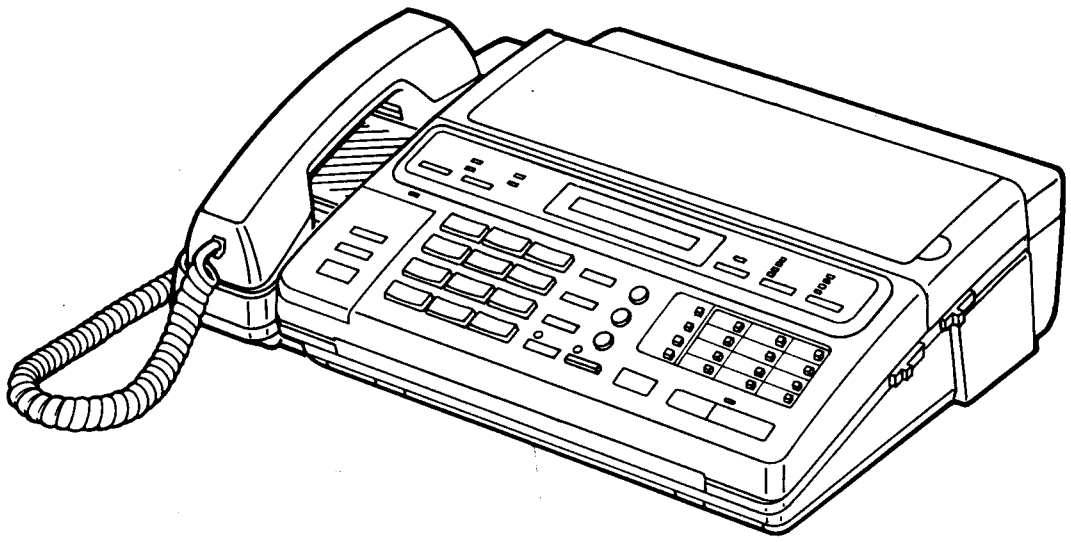
Service Manual

and Technical Guide

TELEPHONE ANSWERING
SYSTEM WITH FACSIMILE

KX-F230

(for U.S.A.)



Panasonic

When you mention the serial number, write down the 11 digits. The serial number may be found on the back of the unit.

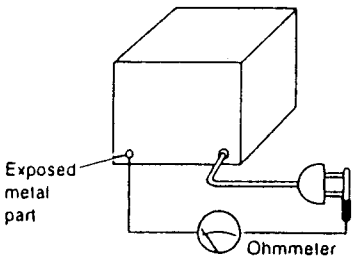
TABLE OF CONTENTS (General)

SAFETY PRECAUTIONS

1. Before servicing, unplug the power cord to prevent an electric shock.
2. When replacing parts, use only manufacturer's recommended components for safety.
3. Check the condition of the power cord. Replace if wear or damage is evident.
4. After servicing, be sure to restore the lead dress, insulation barriers, insulation papers, shields, etc.
5. Before returning the serviced equipment to the customer, be sure to make the following insulation resistance test to prevent the customer from being exposed to a shock hazard.

INSULATION RESISTANCE TEST

1. Unplug the power cord and short the two prongs of the plug with a jumper wire.
2. Turn on the power switch.
3. Measure the resistance value with ohmmeter between the jumpered AC plug and each exposed metal cabinet part, such as screwheads, control shafts, handle brackets, etc.
   *Note: Some exposed parts may be isolated from the chassis by design. These will read infinity.
4. If the measurement is outside the specified limits, there is a possibility of a shock hazard. The equipment should be repaired and rechecked before it is returned to the customer.



Resistance=Approx 1 MΩ
(at DC 250 V)

FOR SERVICE TECHNICIANS

ICs and LSIs are vulnerable to static electricity.
When repairing, the following precautions will help prevent recurring malfunctions.
1) Cover the plastic parts boxes with aluminum foil.
2) Ground the soldering irons.
3) Use a conductive mat on the worktable.
4) Do not grasp IC or LSI pins with bare fingers.

SPECIFICATIONS

This specifications is for U.S.A. version only.
Refer to this simplified manual (cover) for other areas.

1. Integrated Telephone System (ITS) Section

Type:	K type handset, Single line ITS
	Push button type 12 key dial pad
Function:	Speaker Phone (Volume control type)
	12 stations automatic dialer (30 digits)
	Auto redial
	Combination dialing
	100 speed dialer
	Ringer control (3-steps control type)
	Pulse dialing or DTMF (Tone) Dialing
	Handset Receiver Volume (3-steps control type)

2. Automatic Telephone Answering System (ATAS) Section

Type:	1 micro cassette automatic logic control mode
	Semiconductor record/playback mode OGM
	DTMF tone remote control
Function:	Remote turn on
	Message memo (Remote record/playback type)
	2 way record
	Call counter (Remote listening)
	Operation selectable 3 digits ID code
	CPC control
	TEL, FAX, TEL/FAX, ANS/FAX selector
	Paper curl reduction

3. Facsimile Section

Type:	Desk top
Applicable Lines:	Public switched telephone network
Compatibility:	CCITT G3
Document Size:	MAX. 216 mm (8½″) in width, MAX. 600 mm (23⅝″) in length
Effective Scanning Width:	MAX. 208 mm (8³⁄₁₆″)
Printing Paper Size:	216 mm (letter)×30 m roll (8½″×98 ft roll)
Effective Printing Width:	208 mm (8³⁄₁₆″)
Transmission Time*:	Approx. 30 sec/page (G3 Normal mode)
	Approx. 15 sec/page (Original mode)
Scanning Density:	Horizontal 8 pels/mm (203 pels/inch)
	Vertical 3.85 lines/mm (98 lines/inch)—Standard
	7.7 lines/mm (196 lines/inch)—Fine
	15.4 lines/mm (392 lines/inch)—Superfine
Image Sensor Type:	CCD image sensor
Printer Type:	Thermal printer
Data Compression System:	Modified Huffman (MH), Modified Read (MR)
Modem Speed:	9600/7200/4800/2400 bps; Automatic fallback
Function:	12 stations automatic transmission
	Automatic document feeder (Max. 10 page), Polling
	Paper save function, Extension Copy, Silentfax Receiving,
	Remote Fax Activation, Paper Cutter

4. General

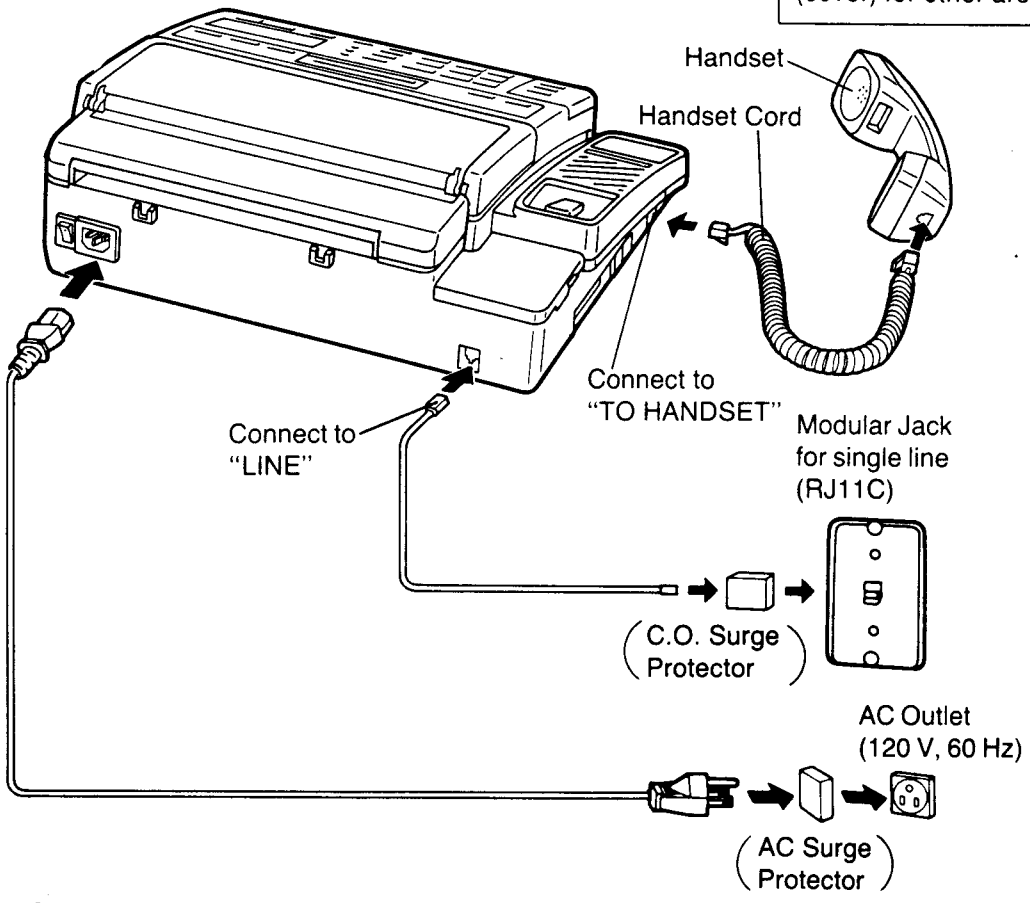
Power Supply:	AC 120 V, 60 Hz
Power Consumption:	Approx. 50 W
	1 Battery 3 V (Lithium Battery)...for Memory Backup and Timer Backup
LCD:	20×2 line
Speaker:	5 cm (1³¹⁄₃₂″) PM dynamic
Microphone:	Condensor microphone (for OGM, MEMO/2 WAY, SP-Phone)
Dimensions (H×W×D):	112×379×300 mm (4¹³⁄₃₂×14²⁹⁄₃₂×11¹³⁄₁₆)
Weight:	5.6 kg (12 lb. 5.5 oz)

*Transmission Time: Transmission time applies to text data using CCITT No. 1 test chart, between same machine models at maximum modem speed.
Transmission time varies in actual usage.

Design and specifications are subject to change without notice.

CONNECTION

This connection is for U.S.A. version only.
Refer to this simplified manual (cover) for other areas.

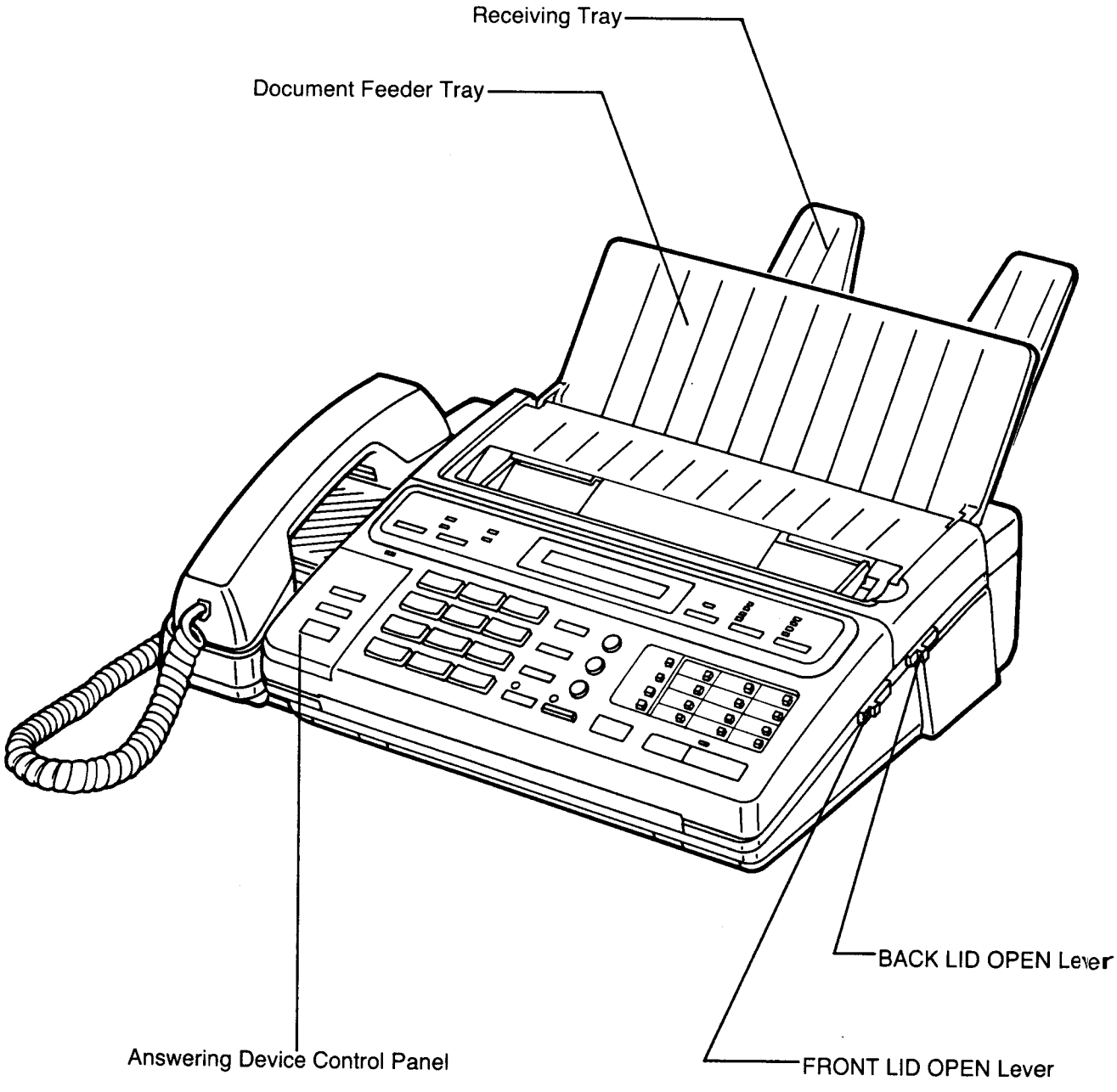


NOTES:

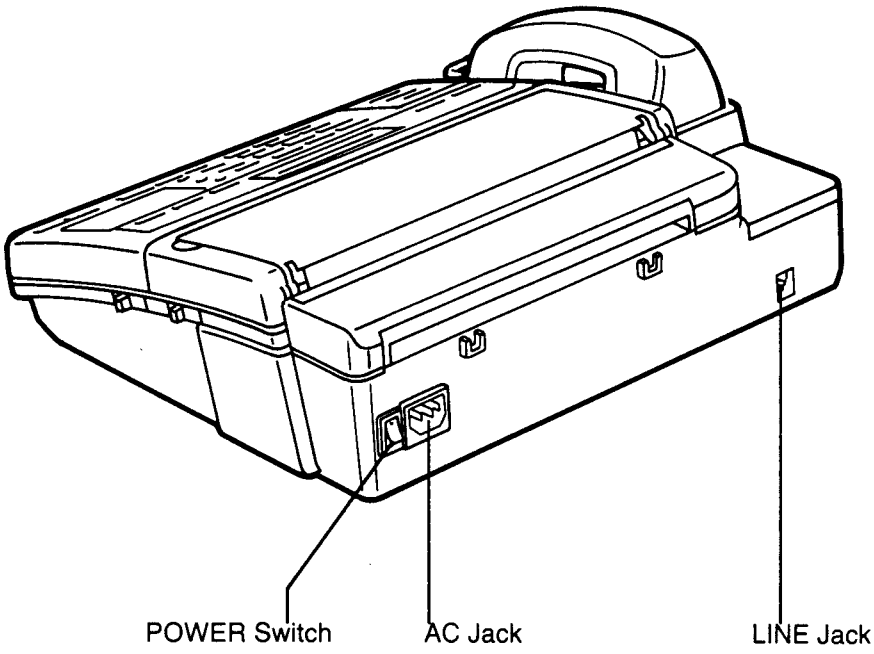
- The unit will not function during a power failure or when the power is turned off. However, if you have a reserve telephone connected to the port marked "TEL", you will still be able to make calls.
- Connection to integrated answering machines is not recommended.
- This unit is equipped with a 3-wire grounded type plug for safety. If you are unable to insert the plug into your outlet, contact your electrician to replace your outlet.
- We recommend the use of an exclusive AC outlet to avoid interference from other equipment.
- Place the equipment close to the socket outlet so the socket is easily accessible.
- If your unit is connected to the same line as other extensions, do not use other extensions during fax transmission and reception. Image quality will be affected.
- For additional equipment protection, we recommend the use of a surge protector such as TELESPIKE BLOK MODEL TSB (TRIPPE MFG. CO.), SPIKE BLOK MODEL SK6-0 (TRIPPE MFG. CO.), SUPER MAX (PANAMAX) or MP1 (ITW LINX).

LOCATION OF CONTROLS

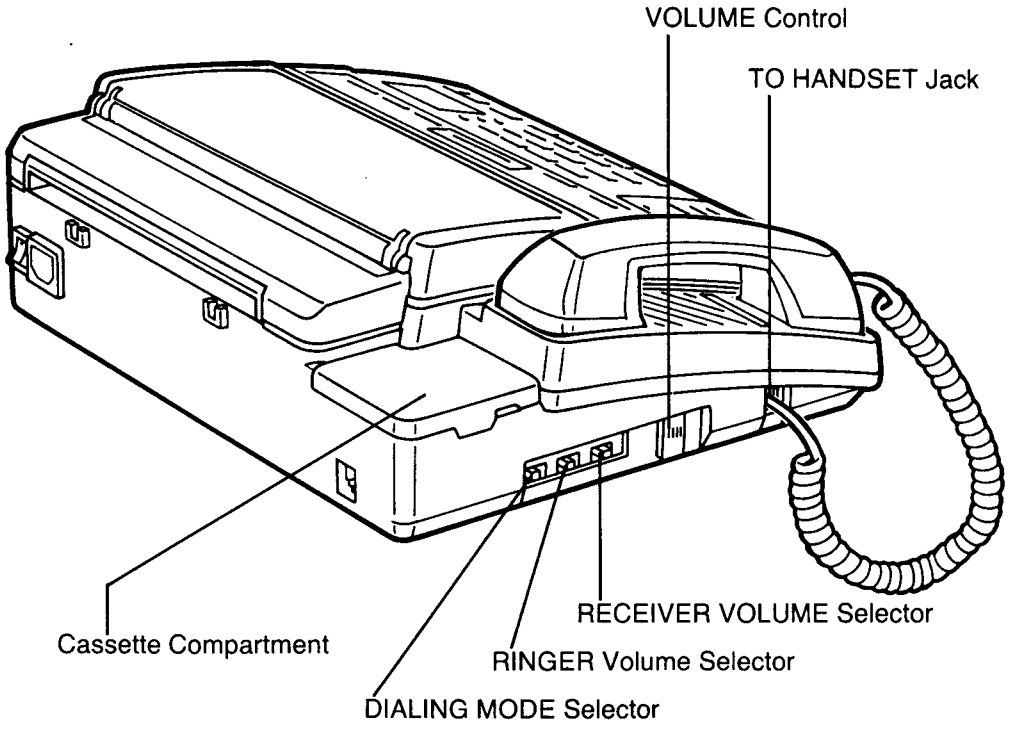
Front view

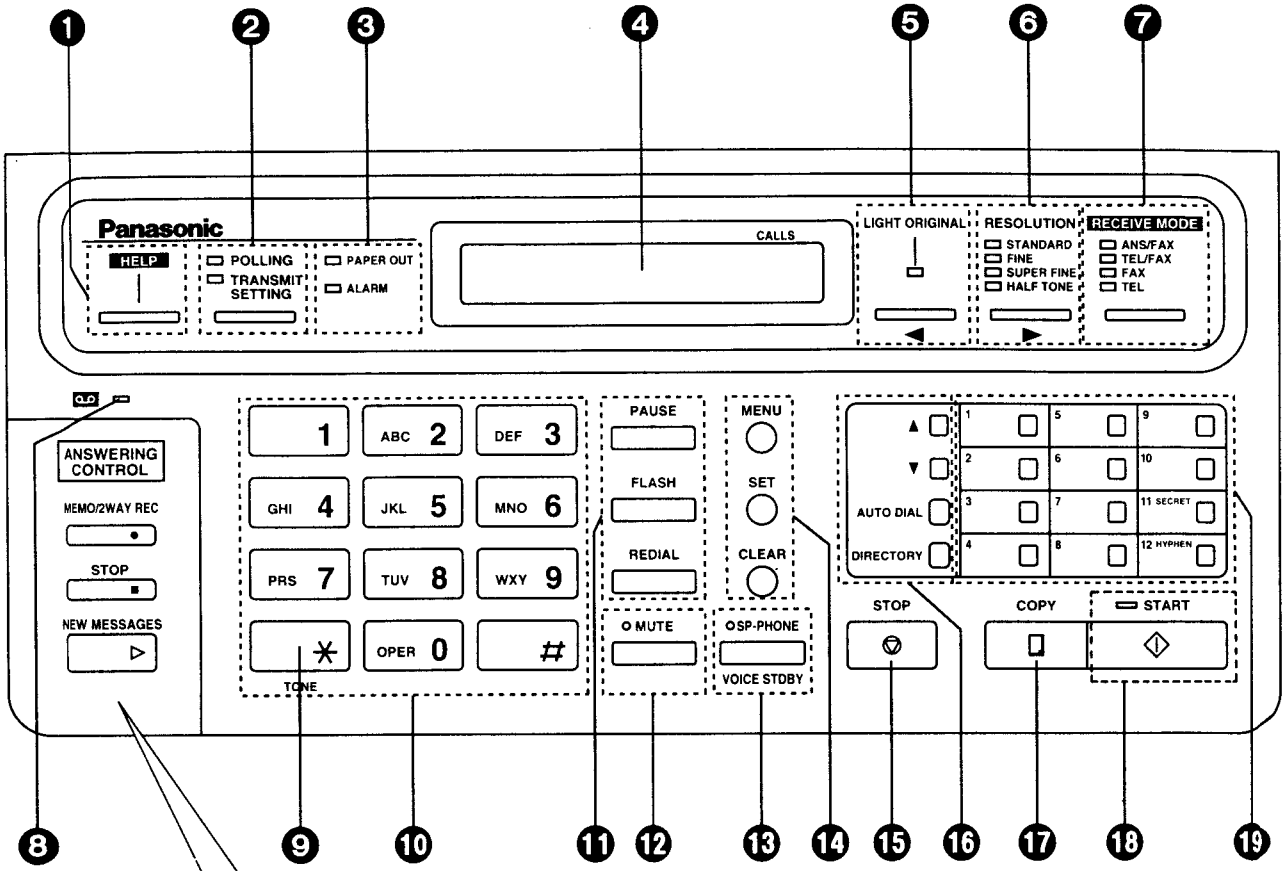


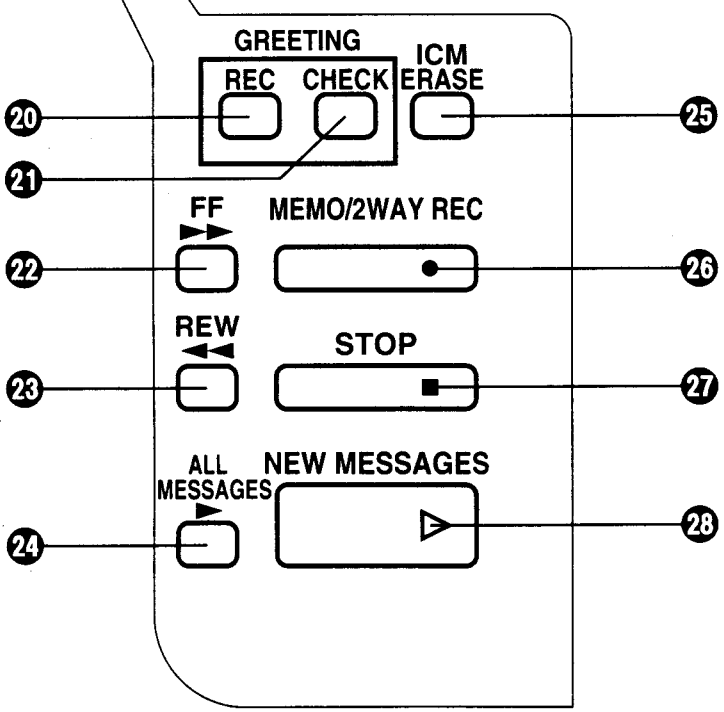
Rear view



Side view







❶ **HELP Button:**	Used to print an easy guide of programming procedures.
❷ **POLLING/TRANSMIT SETTING Button and Indicators:**	Used for polling function. Also used to set the total page number before transmission. The indicators light when these features are on.
❸ **PAPER OUT Indicator:**	The indicator lights when the recording paper roll is empty.
ALARM Indicator:	The indicator lights when any trouble occurs.
❹ **LCD (Liquid Crystal Display)**	
❺ **LIGHT ORIGINAL Button and Indicator/◀ Key:**	Used to transmit or copy originals with faint writing. The indicator lights when this feature is on. Also used as the cursor key during programming.
❻ **RESOLUTION Button and Indicators/▶ Key:**	Used to adjust scanning line density. The indicators light to show which setting you are using. Also used as the cursor key during programming.
❼ **RECEIVE MODE Button and Indicators:**	Used to select the desired receiving mode. The indicators light to show the mode in which the unit is set.
❽ **Indicator:**	The indicator flashes when any new incoming messages have been recorded.
❾ **TONE Button:**	Used to change the dialing mode from pulse to tone during a dialing operation.
❿ **Dial Keypad/Character Keys:**	Used to dial phone numbers or enter parameters while programming. Also used as character keys when logo and station names are programmed.
⓫ **PAUSE Button:**	Used to insert a pause into a phone number during a dialing operation or programming.
FLASH Button:	Used to access some features of your host PBX.
REDIAL Button:	Used to redial the last dialed number.
⓬ **MUTE Button and Indicator:**	Used when you do not want your voice to be heard by the other party. The voice of the calling party will still be heard. The indicator lights when this feature is on.
⓭ **SP-PHONE (VOICE STDBY) Button and Indicator:**	Used for on-hook dialing and voice contact features. The indicator lights when these functions are on.
⓮ **MENU Button:**	Used to start delayed transmission, system setup, etc.

SET Button: Used to store parameters during programming.

CLEAR Button: Used to clear the previously entered parameters during programming.

⑮ **STOP (▽) Button:** Used to cancel transmission or copying operation.

⑯ **▲ Button:** Used to put back the items in the electric telephone directory.

▼ Button: Used to advance the items in the electric telephone directory.

DIRECTORY Button: Used to enter the electric telephone directory mode.

AUTO DIAL Button: Used for speed dialing.

⑰ **COPY Button:** Used to start copy functions.

⑱ **START Button and Indicator:** Used to start transmission or print lists and reports. The indicator lights when these functions are on.

⑲ **Direct Call Station Keys/ Character Keys:** Used for one touch dialing. Also used as character keys when logo and station names are programmed.

⑳ **REC Button:** Used to start and stop recording of a greeting message.

㉑ **CHECK Button:** Used to replay your greeting message.

㉒ **FF (Fast Forward) Button:** Used to run the tape quickly forward to a desired point.

㉓ **REW (Rewind) Button:** Used to run the tape quickly backward to a desired point.

㉔ **ALL MESSAGES Button:** Used to play back all the recorded messages.

㉕ **ICM ERASE Button:** Used to erase recorded incoming messages at high speed.

㉖ **MEMO/2WAY REC Button:** Used to start and stop recording of a memo message or a telephone conversation.

㉗ **STOP (■) Button:** Used to stop operations of answering device.

㉘ **NEW MESSAGES Button:** Used to play back only new messages.

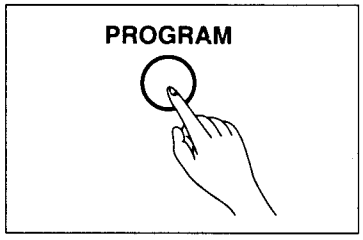
NEW FEATURES

1. REMOTE TAD ID

1-1. SETTING THE REMOTE CODE (REMOTE TAD ID) FOR REMOTE TAD OPERATION

The REMOTE TAD ID is used to access your answering device (TAD) from a remote location with a touch tone phone. See pages 12~17.
Using this code, you can retrieve incoming messages recorded on the microcassette tape from a remote location.
The REMOTE TAD ID is preset to 111. If you wish to change the number, you can choose any number from 111 to 999 except numbers including "0".
For proper operation, make sure that the REMOTE TAD ID number is different from your PRIVACY RING ID number. (See page 18.)

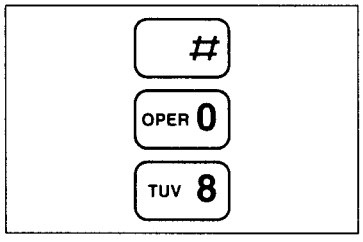
1



Press the **MENU** button until the following is shown.

```
PROGRAM[1.DATE 2.TEL
3.SYSTEM 4.REPORT]
```

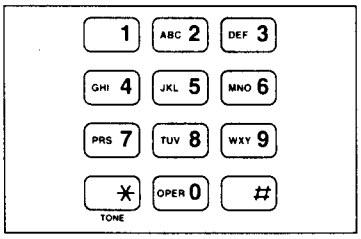
2



Press #, then press **08**.

```
8.ENTER YOUR REMOTE
TAD ID=111
```

3

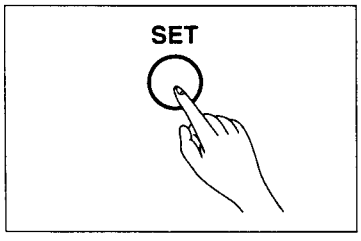


Enter the desired REMOTE TAD ID using the dial keypad.

Example: The REMOTE TAD ID is 456.

```
8.ENTER YOUR REMOTE
TAD ID=456
```

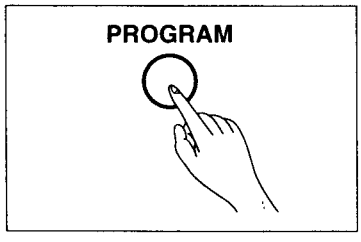
4



Press the **SET** button to store your selection in memory.

```
PROGRAM[1.DATE 2.TEL
3.SYSTEM 4.REPORT]
```

5



Press the **MENU** button to end the operation.

The display shows the current time.

NOTES:

- We recommend that you do not use seven (7) as a code number, since this number is used as the greeting message re-recording command for remote operations.
- If you make a mistake in step 3, use the cursor key (► or ◄) to move the cursor to the incorrect number, then correct input.

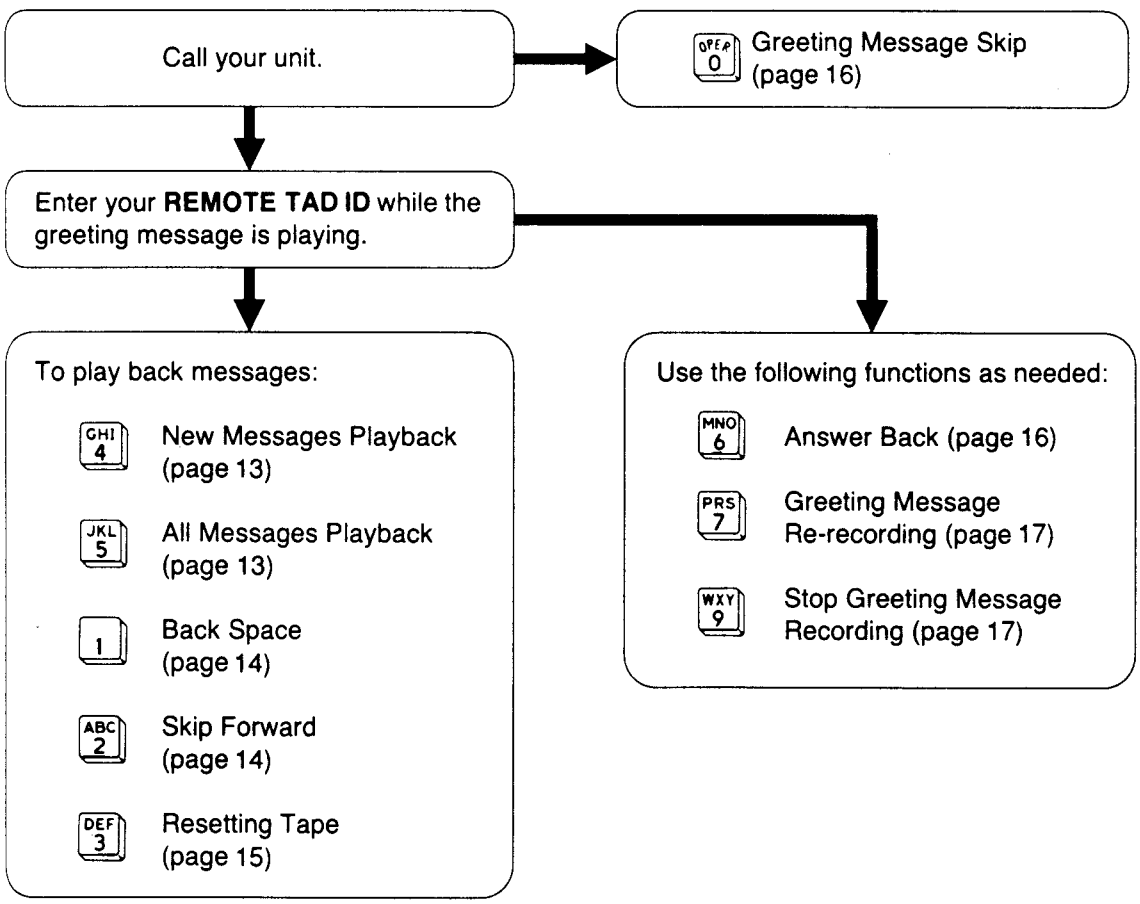
1-2. OPERATING AN ANSWERING DEVICE FROM A REMOTE PHONE

While you are out, you can listen to any recorded incoming messages or re-record your greeting message using a touch tone telephone.

The following features are available on this unit:
—Playing back newly recorded messages
—Playing back all the recorded messages
—Back space and skip forward
—Recording a marker message
—Resetting the tape for future messages
—Answer back
—Skipping the greeting message for incoming message recording mode
—Re-recording the greeting message

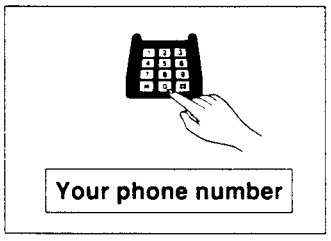
Before using these features, you must program your unique remote code (REMOTE TAD ID) that lets you access the answering device of your unit.
The REMOTE TAD ID is preset to "111" as a default.
If you wish to change the code, see page 11.

Summary of remote control functions

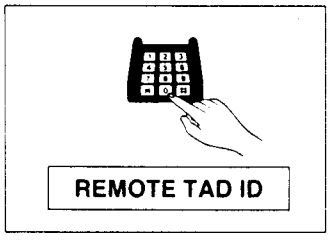


Playing back newly recorded messages (Memory playback)

It is possible to skip over the recorded messages you have already heard and to play back only new messages.

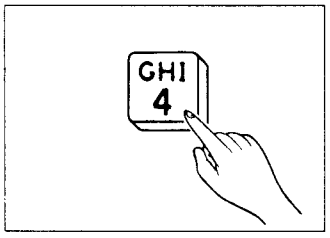
1 

Call your unit.

2 

Dial your REMOTE TAD ID while the greeting message is playing.

A long beep and a short beep(s) will sound. Short beep(s) indicate(s) the number of recorded messages up to 8 times. Even if 9 or more calls are recorded, a short beep sounds 8 times.

3 

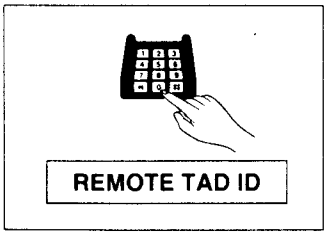
Press **4** immediately after hearing the beeps that indicate the number of recorded messages.

The unit plays back the new messages.

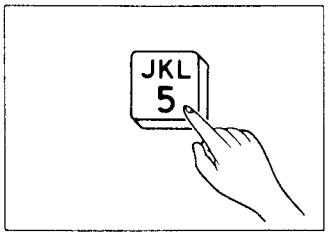
NOTE:
Even during the playback of previously heard messages, you can skip them by pressing 4.

Playing back all the recorded messages

You can listen to all the recorded messages from the beginning of the tape.

1 

Call your unit then dial your REMOTE TAD ID while the greeting message is playing.

2 

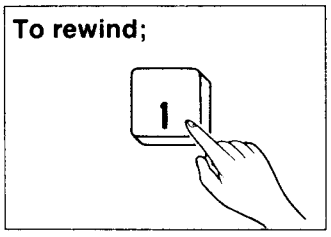
Press **5** within 4 seconds after the short beeps.

The unit will rewind the tape and start to play back all messages.
At the end of the last message, 3 beeps will sound.
After hanging up, all the recorded messages are saved and the unit is ready to record further messages.

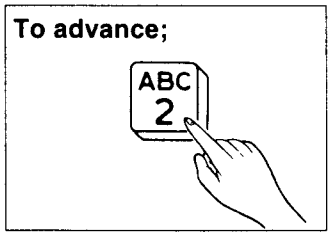
NOTE:
Even if you do not press 5 in Step 2, playback of all messages starts automatically.

Back space and skip forward

While listening to the recorded messages, you can rewind or advance the tape.



To rewind, press **1**.

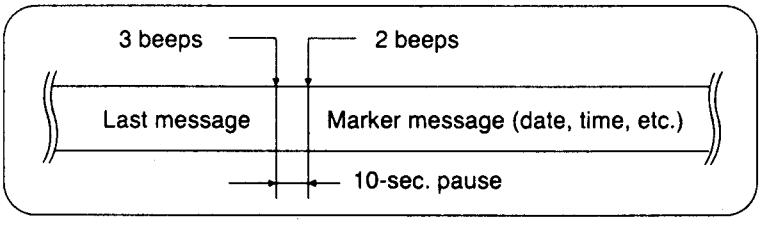


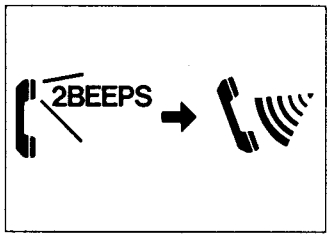
To advance, press **2**.

NOTE:
The maximum length of a message that can be rewound or advanced by one press is approximately 15 seconds. You may have to press 1 or 2 several times to rewind or advance the tape to the desired position.

Recording a marker message

After playing back the recorded messages, you can leave an additional message during the same call. When playback is finished, wait for 3 beeps indicating the end of the last message. Wait about 10 seconds for another 2 beeps indicating that the tape is ready for recording.





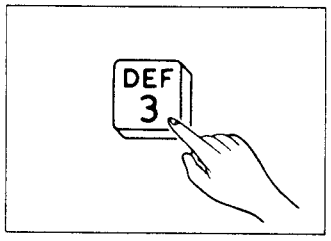
Leave your message after the last 2 beeps.

Hang up when finished. The marker message is recorded after the last message on the tape.

Resetting the tape for future messages

After listening to the recorded messages, you can reset the tape to record future messages from the beginning of the tape.

After all the messages have been played back or even while they are being played;

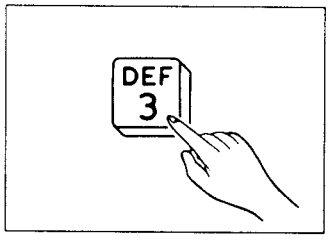


Press **3**, then hang up.

The unit rewinds the tape to the beginning. Future messages will be recorded and the previously recorded messages are erased.

If you have used New Messages Playback;

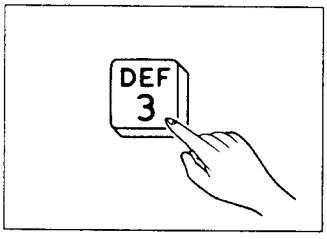
1



Press **3**.

The unit rewinds the tape to the beginning of the newly recorded messages, then beeps.

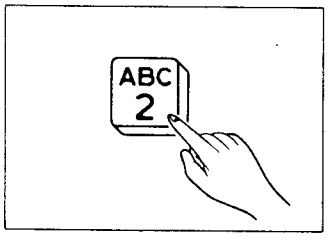
2



Press **3** again after hearing the beep.

The unit rewinds the tape to the beginning of the previously recorded messages.

If you have reset the tape by mistake;

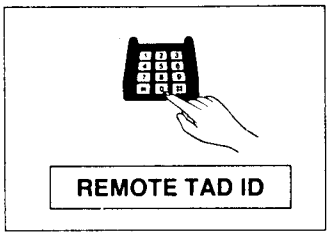


Press **2** after the tape has been reset.

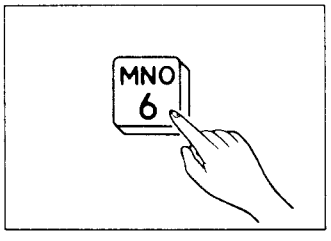
One beep sounds.
The unit advances the tape to the end of the recorded messages.

Answer back

You can monitor the sound in the room where the unit is installed for about 30 seconds. This feature also allows you to speak with anyone in the room where the unit is installed.

1 

Call your unit, then dial your REMOTE TAD ID while the greeting message is playing.

2 

Press **6** after hearing the beeps that indicate the number of recorded messages.

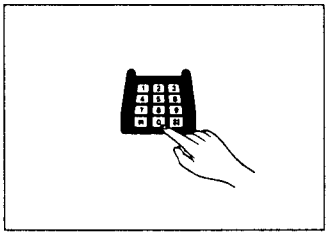
The speaker-phone of the unit in the room is turned on for 30 seconds.

NOTES:

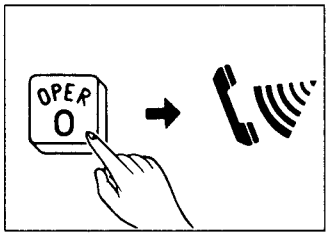
- If you wish to continue monitoring, press 6 again within 10 seconds after hearing one beep.
- If you wish to talk to the other party in the room, inform them to lift the handset or press the SP-PHONE button.
- If the VOLUME control of the unit has been lowered, the party may not be able to hear your voice from the buit-in speaker.

Skipping the greeting message for incoming message recording mode

Callers can leave a message on your unit without listening to your greeting message.

1 

Call your unit.

2 

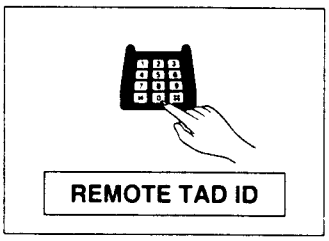
Press **0** while the greeting message is playing.

After hearing a long beep, speak clearly and loudly to leave a message.

Re-recording the greeting message

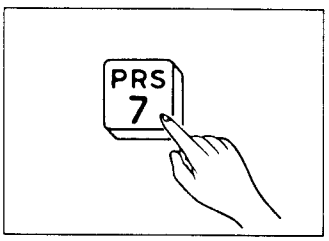
You can change the content of your greeting message from a remote telephone.

1



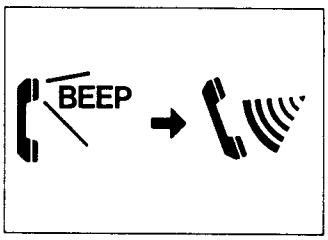
Call your unit, then dial your REMOTE TAD ID while the greeting message is playing.

2



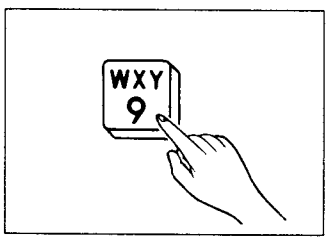
Press **7** to start re-recording after hearing the beeps that indicate the number of recorded messages.

3



After hearing a long beep, speak clearly and loudly for up to 16 seconds.

4



When finished, press **9**.

The new greeting message is played to confirm the change.

NOTE:
If you pause for over 2 seconds while recording, the unit beeps and stops the greeting message recording. In this case, repeat from Step 2 within 10 seconds.

1-3. CALL WITH PRIVACY RING

This feature eliminates interruptions caused by unwanted calls. Only callers with a passcode can activate a distinctive tone during the playing of your greeting message to notify you of a priority call.

Entering a unique 3-digit code activates this feature. Issue your code to those callers with priority status. All other calls will be routed to the answering system unless you pick up the handset.

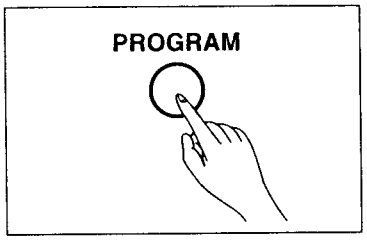
The unit provides PRIVACY RING ID "333" as default setting. If you want to change the number, see the following sentences.

NOTE:
This feature is effective only in the ANS/FAX mode.

Changing the PRIVACY RING ID

You can choose any number of 3 digits except numbers including "0". You should also use a number that is different from the REMOTE TAD ID (see page 11).

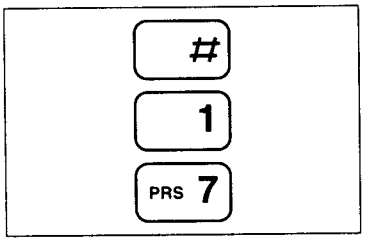
1



Press the **MENU** button until the following is shown.

```
PROGRAM[1.DATE  2.TEL
3.SYSTEM  4.REPORT]
```

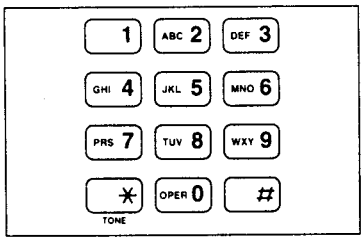
2



Press #, then press **17**.

```
17.PRIVACY  RING  ID
=333
```

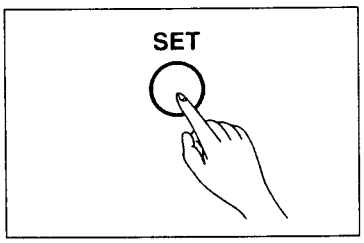
3



Enter the 3-digit number as the new PRIVACY RING ID.

To correct an error, press the **CLEAR** button then correct input.

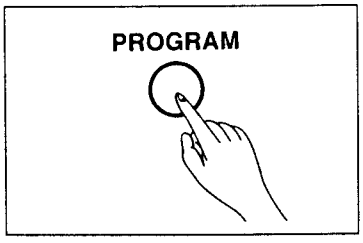
4



Press the **SET** button to store the program in memory.

```
PROGRAM[1.DATE  2.TEL
3.SYSTEM  4.REPORT]
```

5



Press the **MENU** button to end the operation.

The display shows the current time.

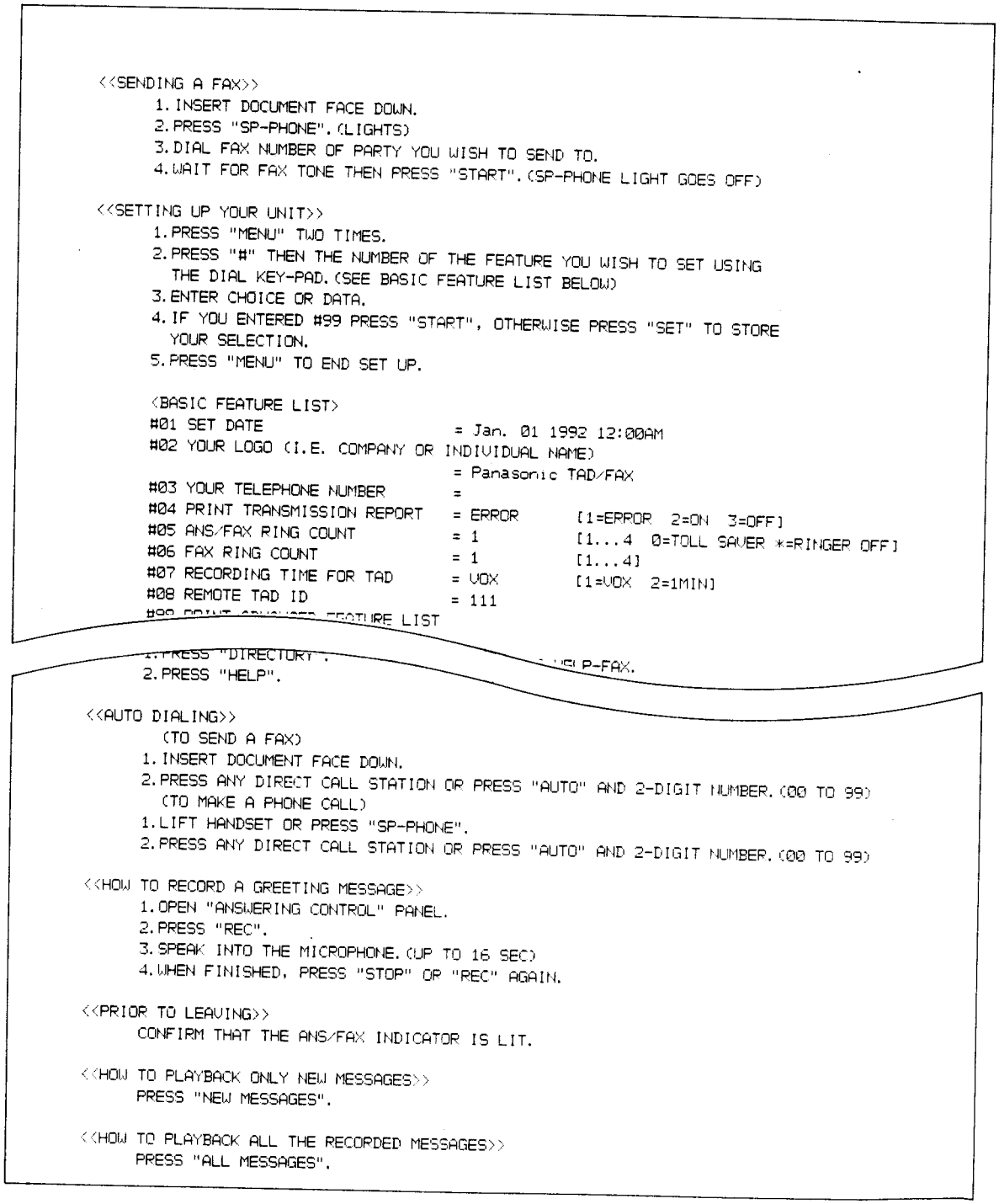
NOTE:
If you set the code number to "000", this feature becomes off.

2. HELP FUNCTION

The HELP button is used to print information about how to send documents, how to set up your unit and how to store phone numbers.

Using the HELP button

■ Press the HELP button when the unit is in the idle status.
The following is printed out.



```
<<SENDING A FAX>>
      1. INSERT DOCUMENT FACE DOWN.
      2. PRESS "SP-PHONE". (LIGHTS)
      3. DIAL FAX NUMBER OF PARTY YOU WISH TO SEND TO.
      4. WAIT FOR FAX TONE THEN PRESS "START". (SP-PHONE LIGHT GOES OFF)

<<SETTING UP YOUR UNIT>>
      1. PRESS "MENU" TWO TIMES.
      2. PRESS "#" THEN THE NUMBER OF THE FEATURE YOU WISH TO SET USING
         THE DIAL KEY-PAD. (SEE BASIC FEATURE LIST BELOW)
      3. ENTER CHOICE OR DATA.
      4. IF YOU ENTERED #99 PRESS "START", OTHERWISE PRESS "SET" TO STORE
         YOUR SELECTION.
      5. PRESS "MENU" TO END SET UP.

      <BASIC FEATURE LIST>
      #01 SET DATE                    = Jan. 01 1992 12:00AM
      #02 YOUR LOGO (I.E. COMPANY OR INDIVIDUAL NAME)
                                      = Panasonic TAD/FAX
      #03 YOUR TELEPHONE NUMBER       =
      #04 PRINT TRANSMISSION REPORT   = ERROR      [1=ERROR  2=ON  3=OFF]
      #05 ANS/FAX RING COUNT          = 1          [1...4  0=TOLL SAVER *=RINGER OFF]
      #06 FAX RING COUNT              = 1          [1...4]
      #07 RECORDING TIME FOR TAD      = VOX        [1=VOX  2=1MIN]
      #08 REMOTE TAD ID               = 111
      #99 PRINT ADVANCED FEATURE LIST

      1. PRESS "DIRECTORY".                                    HELP-FAX.
      2. PRESS "HELP".

<<AUTO DIALING>>
        (TO SEND A FAX)
      1. INSERT DOCUMENT FACE DOWN.
      2. PRESS ANY DIRECT CALL STATION OR PRESS "AUTO" AND 2-DIGIT NUMBER. (00 TO 99)
        (TO MAKE A PHONE CALL)
      1. LIFT HANDSET OR PRESS "SP-PHONE".
      2. PRESS ANY DIRECT CALL STATION OR PRESS "AUTO" AND 2-DIGIT NUMBER. (00 TO 99)

<<HOW TO RECORD A GREETING MESSAGE>>
      1. OPEN "ANSWERING CONTROL" PANEL.
      2. PRESS "REC".
      3. SPEAK INTO THE MICROPHONE. (UP TO 16 SEC)
      4. WHEN FINISHED, PRESS "STOP" OR "REC" AGAIN.

<<PRIOR TO LEAVING>>
      CONFIRM THAT THE ANS/FAX INDICATOR IS LIT.

<<HOW TO PLAYBACK ONLY NEW MESSAGES>>
      PRESS "NEW MESSAGES".

<<HOW TO PLAYBACK ALL THE RECORDED MESSAGES>>
      PRESS "ALL MESSAGES".
```

■ Press the **HELP** button while programming each feature (#01 through #08, #10 and #11).

Example: When you wish to program the SET DATE (#01),

1. Press the **MENU** button until the following is shown.
   The display shows;

```
PROGRAM[1.DATE 2.TEL
3.SYSTEM 4.REPORT]
```

2. Press **1** for SET DATE setting.
   The display shows;

```
 SET DATE [*=AM #=PM]
01 01 92 12:00AM WED
```

3. When you wish to know how to continue programming, press the **HELP** button.
   The following is printed out.

```
<<SETTING THE CLOCK>>
     1.ENTER THE MONTH, DAY, YEAR, HOUR AND MINUTE USING THE DIAL KEY-PAD.
       PRESS THE "*" KEY TO ENTER AM AND PRESS THE "#" KEY TO ENTER PM.
     2.PRESS "SET" TO STORE.
```

4. Resume programming.

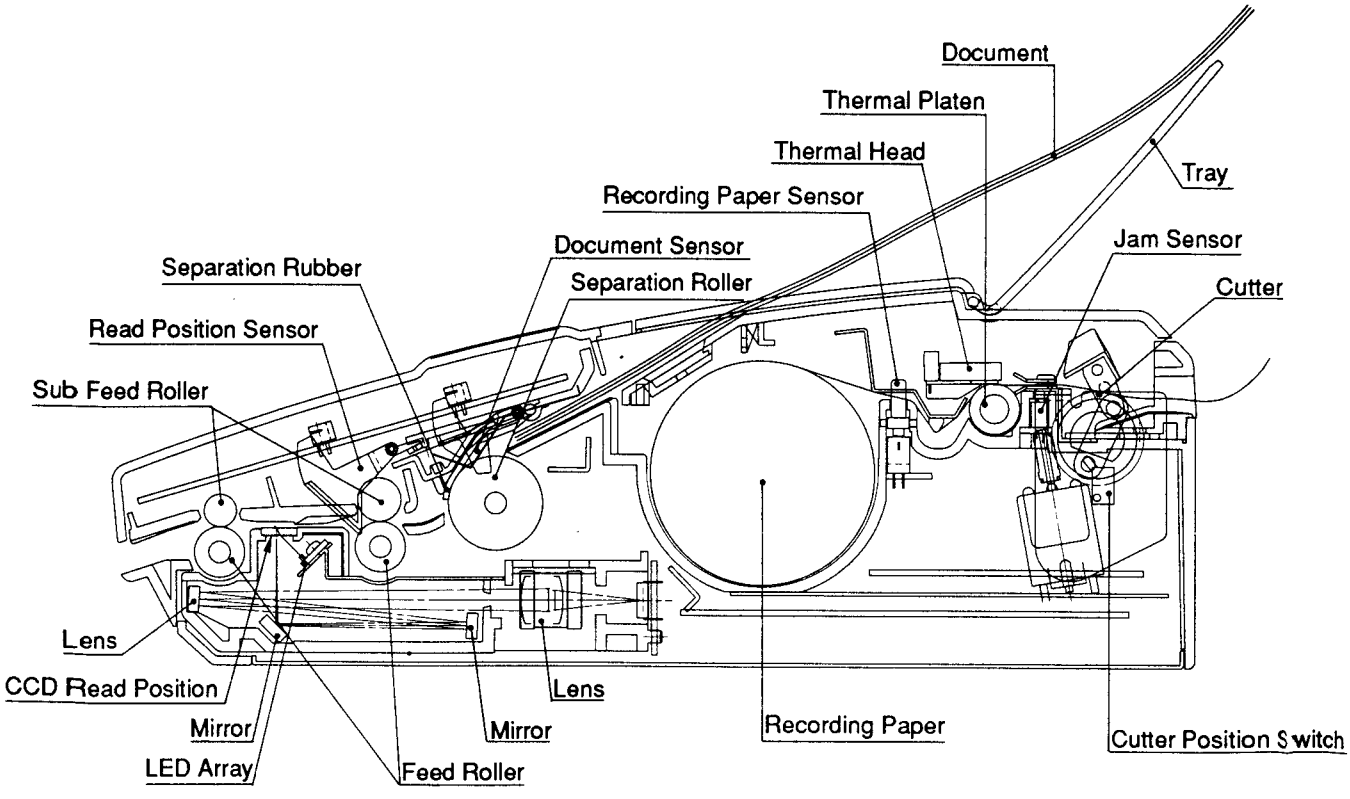
MAINTENANCE ITEM

1. OUTLINE

MAINTENANCE AND REPAIRS ARE PERFORMED USING THE FOLLOWING STEPS.

1) **Periodic maintenance**
   Inspect the equipment periodically and if necessary, clean any contaminated parts.
2) **Check for breakdowns**
   Look for signs of trouble and consider how the problems arose.
   If the equipment can still be used, perform a copying, self testing or communications testing.
3) **Check equipment**
   Perform a copying, self testing and communications testing to determine if the problem originates from the transmitter, the receiver or the telephone line.
4) **Determine causes**
   Determine the causes of equipment trouble by troubleshooting.
5) **Equipment repairs**
   Repair or replace the defective parts and take appropriate measures at this stage to ensure that the problem does not recur.
6) **Confirm normal operation of the equipment**
   After completing the repairs, conduct copying, self testing and communications testing to confirm that the equipment operates normally.
7) **Record keeping**
   Make a record of the measures taken to rectify the problem for future reference.

2. MEINTENANCE CHECK ITEMS

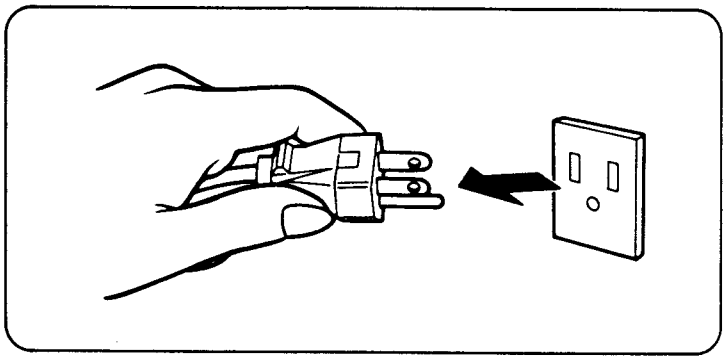


NO.	OPERATION	CHECK ITEM	REMARKS
1	Document Path	Remove any foreign matter such as paper.	-----
2	Rollers	If the roller is dirty, clean it with a damp cloth then dry thoroughly.	See page 24.
3	Thermal Platen	If the platen is dirty, clean it with a damp cloth then dry thoroughly. Remove the paper before cleaning.	See page 77.
4	Thermal Head	If the thermal head is dirty, clean the printing surface with a cloth moistened with denatured alcohol (alcohol without water), then dry thoroughly.	See page 24.
5	LED Array	If the LED array is dirty, clean the glass with a dry soft cloth.	See page 81.
6	Sensors & Switches	Recording paper sensor (PC501), Document sensor (PS1), Read position sensor (PS2), Cover open switch (S4). Confirm operation of sensors.	Pages 57, 58.
7	Mirrors and Lens	If the mirror and lens are dirty, clean it with a dry soft cloth.	-----
8	Cassette Deck	If the capstan, pinch roller and heads are dirty, clean them.	See page 23.
9	Abnormal, wear and tear or looseness of parts	Exchange the part. Check the tightness of screws on all parts.	-----

Note:
The cutter and cutter position switch and motor (for cutter) life is about 100,000 operations.

3. MAINTENANCE

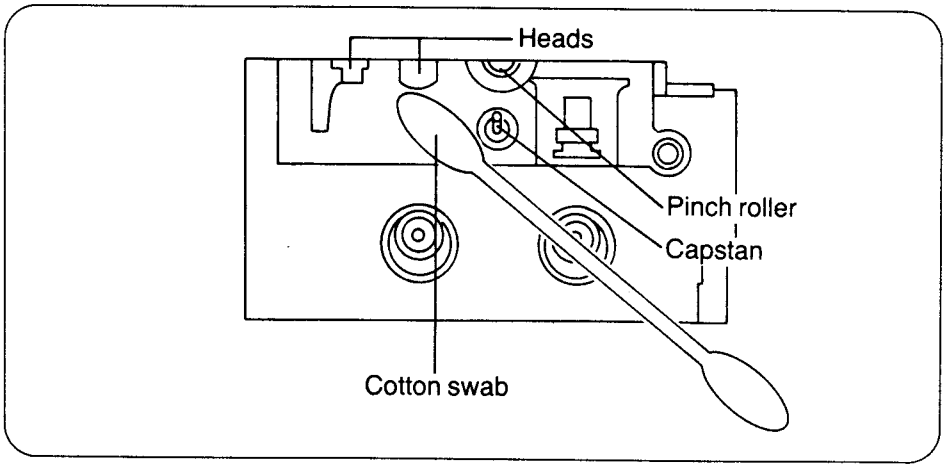
Be sure that the AC plug is disconnected from the outlet before performing any maintenance.



3-1. Cleaning the microcassette compartment

Dirt and residue from the tape may adhere to the heads and capstan causing distortion. Clean these parts periodically in the manner described below for the best sound quality.

1. Open the cassette compartment cover.
2. Remove the microcassette tape.
3. Clean the head surfaces, pinch roller and capstan with a cotton swab.
   If these surfaces are extremely dirty, wipe them with a cotton swab dampened with denatured alcohol, then wipe them with a dry soft cloth.



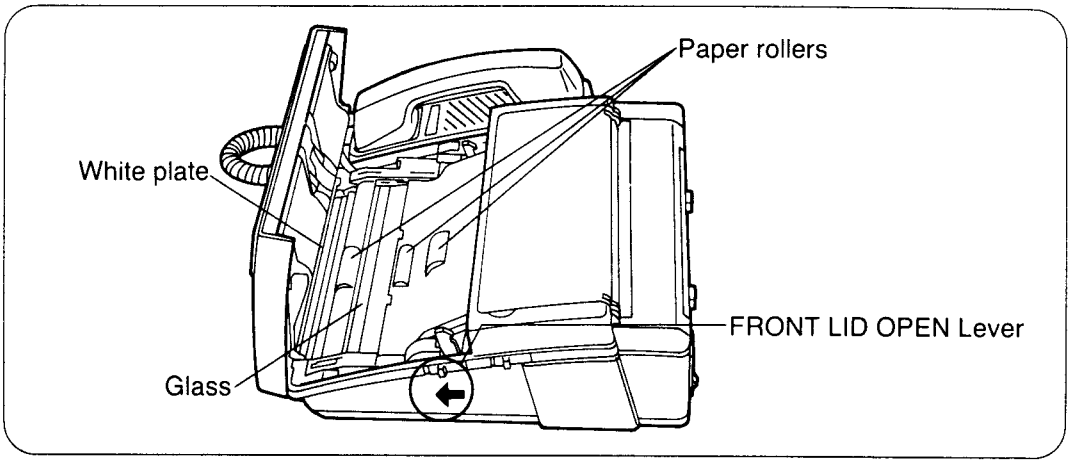
NOTES:

- Do not bring magnetic or metal objects, such as a screwdriver, near the head assembly, as such objects could magnetize the heads.
- Do not oil any part of the unit.

3-2. Cleaning the document feeder unit

If a dirty pattern or black bands appear on a copied or transmitted document, clean the inside of the document feeder unit by following steps below.

1. Open the document feeder unit.
2. Clean the glass and the white plate with a dry soft cloth.
3. Clean the paper rollers with a damp cloth, then dry thoroughly to prevent paper jams.

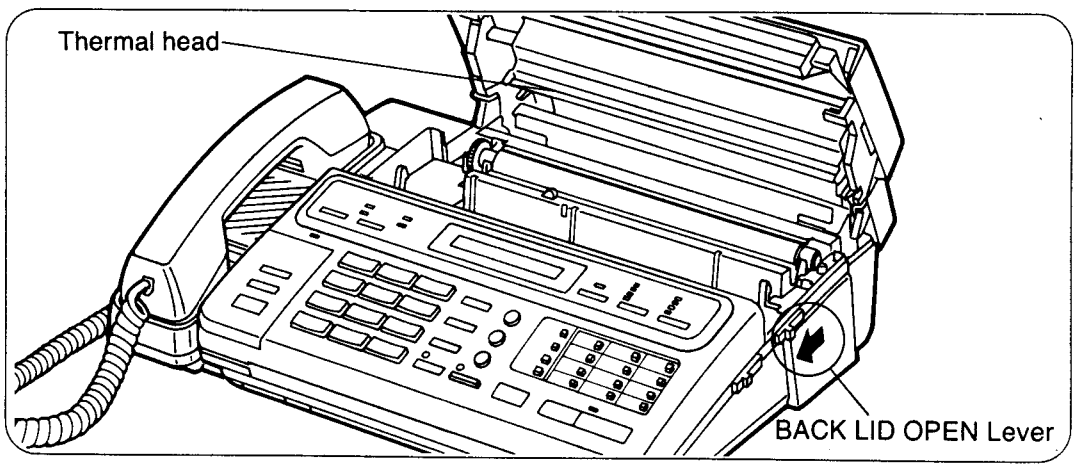


4. Close the document feeder unit.

3-3. Cleaning the thermal head

If a dirty pattern or black bands appear on a copied or received document, clean the thermal head inside the recording paper unit by following steps below.

1. Open the recording paper unit.
2. Remove the recording paper from the unit.
3. Clean the thermal head with a cloth moistened with denatured alcohol (alcohol without water), then dry thoroughly.



4. Then close the recording paper unit.

NOTES:

- To prevent malfunction due to static electricity, do not use a dry cloth and do not touch the thermal head with your finger directly.
- When finished, confirm the print quality by printing the test pattern.

TROUBLESHOOTING GUIDE

TABLE OF CONTENTS

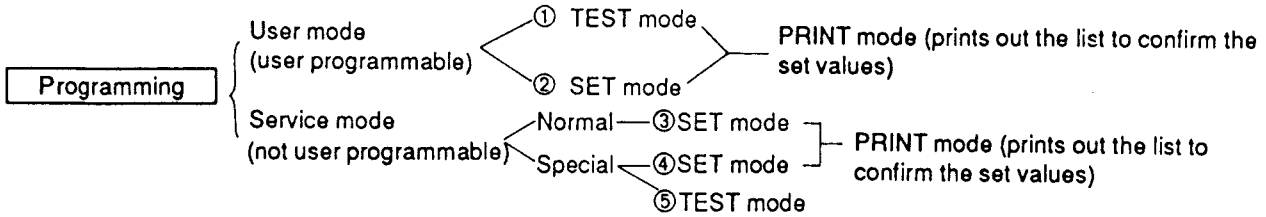
1. PROGRAMMING

The programming functions are used to program the various features and functions of the machine, and to test the machine. Programming can be done in both the on-hook and off-hook conditions. This facilitates communication between the user and the servicer while programming the machine.

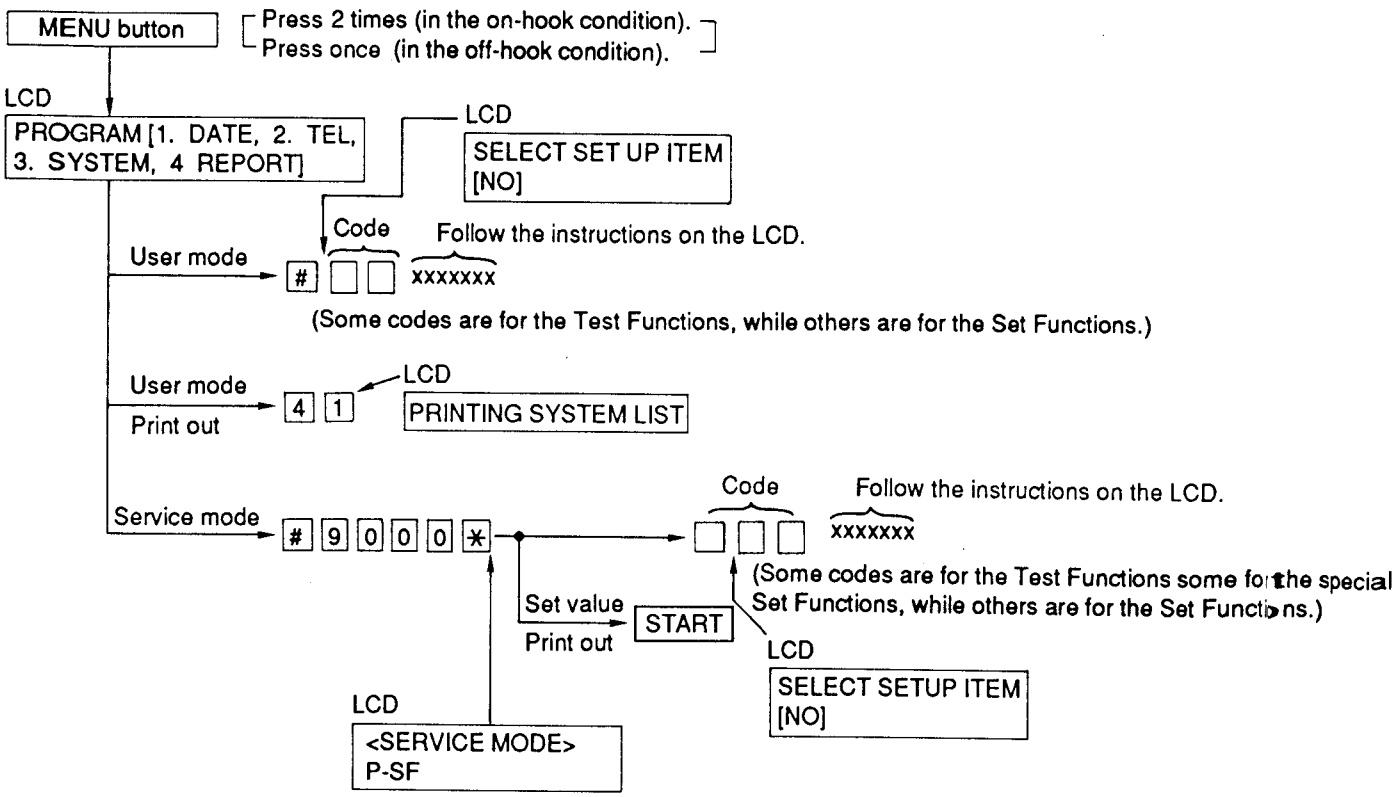
1-1. OPERATION

There are 2 basic categories of programming functions, the User Mode and the Service Mode. The Service Mode is further broken down into the normal and the special programs. The normal programs are those listed in the Operating Instructions and available to the user. The special programs are those listed only here and not displayed to the user. In both User and Service Mode, there are Set Functions and Test Functions. The Set Functions are used to program various features and functions, and the Test Functions are used to test various functions. The Set Functions are accessed by entering their code, changing the appropriate value, then pressing the SET key. The Test Functions are accessed by entering their code and pressing the key listed on the menu. While programming, to cancel any entry, press the STOP key.

1-2. OPERATION FLOW



Operating Procedure



1-3. USER MODE (The list below is an example of the SYSTEM SETUP LIST the unit prints out.)

```
********************* < BASIC SYSTEM PARAMETERS > ***************************************************
*                                                                                                   *
*              #01 SET DATE                  = Jan. 04 1992 05:34AM                               *
*    Code      #02 YOUR LOGO (I.E. COMPANY OR INDIVIDUAL NAME)                                    *
*                                           = Panasonic TAD/FAX                                   *
*              #03 YOUR TELEPHONE NUMBER     =                                                    *
*              #04 PRINT TRANSMISSION REPORT= ON            [1=ERROR  2=ON  3=OFF]                *
*              #05 ANS/FAX RING COUNT        = 1            [1...4  0=TOLL SAVER *=RINGER OFF]    *
*              #06 FAX RING COUNT            = 1            [1...4]                               *
*              #07 RECORDING TIME FOR TAD    = VOX          [1=VOX  2=1MIN]                       *
*              #08 REMOTE TAD ID             = 111                                                *
*              #99 PRINT ADVANCED SETTING LIST                                                    *
*                                                  Set Value                                        *
*                                                                                                   *
*****************************************************************************************************
```

```
********************* < ADVANCED SYSTEM PARAMETERS > ************************************************
*                                                  Set Value                                        *
*              #10 LOGO POSITION             = OUT          [1=OUT  2=IN  3=OFF]                  *
*    Code      #11 JOURNAL AUTO PRINT        = AUTO         [1=AUTO 2=MANUAL]                     *
*              #12 NETWORK PASSCODE          = 0000                                               *
*              #13 TX PASSCODE CHECK         = OFF          [1=ON   2=OFF]                        *
*              #14 RX PASSCODE CHECK         = OFF          [1=ON   2=OFF]                        *
*              #15 POLLING PASSWORD          = 0000                                               *
*              #17 PRIVACY RING ID           = 333                                                *
*              #18 DAY/NIGHT MODE            = OFF          [1=ON   2=OFF]                        *
*                          DAY TIME          =                                                    *
*                          NIGHT TIME        =                                                    *
*              #19 SILENT FAX RECOGNITION RING= 3           [3...8]                               *
*              #20 REMOTE FAX ACTIVATION CODE = **                                               *
*              #21 PAPER SAVE FUNCTION       = OFF          [1=ON   2=OFF]                        *
*              #22 MESSAGE ALERT             = OFF          [1=ON   2=OFF]                        *
*              #23 ENTER MESSAGE D                                                                *
*                          A= ***     CONFIDENTIAL     ***                                        *
*                          B= *** URGENT REPLY REQUEST ***                                        *
*                          C= ***  URGENT PLEASE READ  ***                                        *
*                                                                                                 *
*              #24 EXTENSION COPY                                                                 *
*              #26 PRINT JOURNAL                                                                  *
*              #27 PRINT TEL LIST                                                                 *
*              #28 PRINTER TEST                                                                   *
*              #50 SET DEFAULT (#10 TO #22)                                                       *
*              #9000* (SERVICE DATA SET UP)                                                       *
*                                                                                                 *
*              <DELAYED XMT>                                                                      *
*                DELAYED MODE                = OFF                                            *
*                PHONE NUMBER                =                                                *
*                START TIME                  = 12:00 AM                                       *
*                PAGE COUNTER                =                                                *
*                MESSAGE OUT                 = OFF                                            *
*                                                                                                 *
*                                                                                                 *
*************************************************************************************************
```

Note:
The above values are default.

1-4. SERVICE FUNCTION TABLE

Code	Function	Set Value	Effective Range	Default	Remarks
501	Pause time set	×100 ms.	000~600	050	
502	Flash time set	×10 ms.	01~99	70	
503	Dial speed select	1..10PPS 2..20PPS	1, 2	1	
510	VOX time select	1..6 seconds 2..4 seconds	1, 2	1	
520	CED frequency select	1..2100 Hz 2..1100 Hz	1, 2	1	
521	International mode select	1..On 2..Off	1, 2	1	
522	Auto recovery select	1..On 2..Off	1, 2	1	
523	Receive equalizer select	1..0.0 Km 2..1.8 Km 3..3.6 Km 4..7.2 Km	1~4	2	
524	Transmit equalizer select	1..0.0 Km 2..1.8 Km 3..3.6 Km 4..7.2 Km	1~4	2	
550	Memory clear (Refer to page 33.) Returns the set values of #04~#23 (user selectable) to default.				"START" input
551	ROM check (Refer to page 33.)				"START" input
552	DTMF single tone transmit select	1..On 2..Off	1, 2	2	Refer to page 15.
553	Monitor on FAX communication select	1..all phases 2..phase B 3..Off	1~3	3	
554	Modem test (Refer to page 33.)				"START" input
555	Scanner test (Refer to page 33.)				"START" input
556	Motor test (Refer to page 33.)				"START" input
557	LED test (Refer to page 33.)				"START" input
558	LCD test (Refer to page 33.)				"START" input
559	Paper jam detection select	1..On 2..Off	1, 2	1	
560	Cutter select	1..on 2..off	1, 2	1	
561	KEY test (Refer to page 33.)				"START" input
562	Cutter test (Refer to page 33.)				"START" input
563	CCD position adjustment value set	×1 mm	00~30	15	
565	LCD density	1..Dark 2..Normal 3..Light	1, 2, 3	2	

Code	Function	Set Value	Effective Range	Default	Remarks
570	BREAK % select	1..61% 2..67%	1, 2	1	
571	ITS auto redial time set	×number of times	00~99	14	
572	ITS auto redial line disconnection time set	× second	001~999	030	
573	Remote turn-on ring number set	×number of rings	01~99	15	
574	Dial Tone Detection set	1..On 2..Off	1, 2	2	
580	TAM sequential tone detection select	1..On 2..Off	1, 2	1	
581	ICM Tape End Detection set	1..On 2..Off	1, 2	2	
582	2-way recording select	1..Enable 2..Disable	1, 2	1	
583	2-way beep time set	×1 ms.	000~999	000	
586	White line skip 1 select	1..On 2..Off	1, 2	1	
587	White line skip 2 select	1..On 2..Off	1, 2	1	
590	FAX auto redial time set	×number of times	00~99	05	
591	FAX auto redial line disconnection time set	×second	001~999	045	
592	CNG transmit select	1..auto/manual 2..auto 3..Off	1~3	1	
593	Time between CED and 300 bps	1..75 ms 2..500 ms 3..1 sec	1, 2, 3	1	
594	Overseas DIS detection select	1..detects at the 1st time 2..detects at the 2nd time	1, 2	1	
595	Receive error limit value set	×number of times	001~999	100	
596	Transmit level set	×dBm	−15~00	10	The values entered without "minus sign" will be regarded as negative.
597	Transmit speed 2400BPS fixed mode select	1..On 2..Off	1, 2	2	

Code	Function	Set Value	Effective Range	Default	Remarks
717	Transmit speed select	1..9600BPS 2..7200BPS 3..4800BPS 4..2400BPS	1~4	1	The fall back starts from each speed.
718	Receive speed select	1..9600BPS 2..7200BPS 3..4800BPS 4..2400BPS	1~4	1	The fall back starts from each speed.
719	Ringer Off in TEL/FAX mode	1..On 2..Off	1, 2	1	Selects whether the ring is on or off when the unit receives an incoming signal in the TEL/FAX mode when the ringer.
720	Manual tone detect	1..On 2..Off	1, 2	2	Sets the tone detection mode after dialling manually.
731	CPC mode select	1..A 2..B	1, 2	1	
——	User setting list output				"START" input

DTMF single tone transmit select

When set to ON (=1), the 12 keys and transmission frequencies are as shown.

Key	Frequency(Hz)	Key	Frequency(Hz)
"1"	697	"5"	1209
"2"	770	"6"	1366
"3"	852	"7"	1477
"4"	941		

When set to OFF (=2), the 12 keys and transmission frequencies are as shown.

Low(Hz) \ High(Hz)	1209	1366	1477
697	"1"	"2"	"3"
770	"4"	"5"	"6"
852	"7"	"8"	"9"
941	"*"	"0"	"#"

1-5. SERVICE MODE SETTING VALUES (Example of a printed out list)

```
********************************************* SERVICE DATA LIST *********************************************
*          Code                  Set Value                                                                  *
*       501 PAUSE TIME      = 050*100ms[001...600]*100ms                                                   *
*       502 FLASH TIME      = 70*10ms  [01...99]*10ms                                                      *
*       503 DIAL SPEED      = 10pps    [1=10   2=20  ]pps                                                  *
*       510 VOX TIME        = 6sec     [1=6    2=4   ]sec                                                  *
*       520 CED FREQ.       = 2100Hz   [1=2100 2=1100]Hz                                                   *
*       521 INTL. MODE      = ON       [1=ON   2=OFF ]                                                     *
*       522 AUTO STANDBY    = ON       [1=ON   2=OFF ]                                                     *
*       523 RX EQL.         = 1.8Km    [1=0.0  2=1.8  3=3.6  4=7.2]Km                                      *
*       524 TX EQL.         = 1.8Km    [1=0.0  2=1.8  3=3.6  4=7.2]Km                                      *
*                                                                                                          *
*       <<  SPECIAL SERVICE SETTINGS  >>                                                                   *
*       552  553  559  560  563  570  571  572  573  574  575  580  581  582  583  586  587  590          *
*  Code   2    3    1    1   13    1   14  030   15    2    2    1    2    1  000    1    1   05          *
*            Set Value                                                                                     *
*       591  592  593  594  595  596  597  717  718  719  720  731  771                                    *
*       045    1    1    1  100  -10    2    1    1    1    2    1    1                                    *
*                                                                                                          *
************************************************************************************************************
```


Note:
The above values are default.

2. TEST FUNCTIONS

Test mode	Type of Mode	•Code ☐☐ •Operation after code input.	Function
PRINT TEST	User mode	[2][8] START	Print a test pattern and check the thermal head for abnormalities (missing dots, etc.), and also check the operation of the reception motor.
MOTOR TEST	Service Mode	[5][5][6] START	Rotate the transmission and reception motors to check the operation of the motors.
MODEM TEST	Service Mode	[5][5][4] START	Send four kinds of FAX signals to check the sending function of the modem. 1) 1100 Hz: Consecutive signal of EOM for tonal. 2) 2100 Hz: G2 carrier signal Consecutive of CED signal 3) G3, V29 training signal [modulation wave of carrier signal (1700 Hz)]
ROM CHECK	Service Mode	[5][5][1] START	Indicate the version and check sum of the ROM.
SCAN CHECK	Service Mode	[5][5][5] START	Turn on the LEDs of the image sensor and operate the read system.
LCD CHECK	Service Mode	[5][5][8] START	Check the LCD indication. Illuminate all dots to check if they are normal.
DTMF SINGLE TEST	Service Mode	[5][5][2] 1..On 2..Off	Output the DTMF by single tone.
LED TEST	Service Mode	[5][5][7] START	All LEDs flashes on and off, or is illuminated.
KEY CHECK	Service Mode	[5][6][1] START {any key}	Check the operation button. Indicate the button code at LCD after the button is pressed.
FACTORY SET	Service Mode	[5][5][0] START	Clear the memory in which the user can store data.
CUTTER TEST	Service Mode	[5][6][2] START	Check the cutter operation.

3. COMMUNICATION ERROR FUNCTIONS

3.1 OPERATION

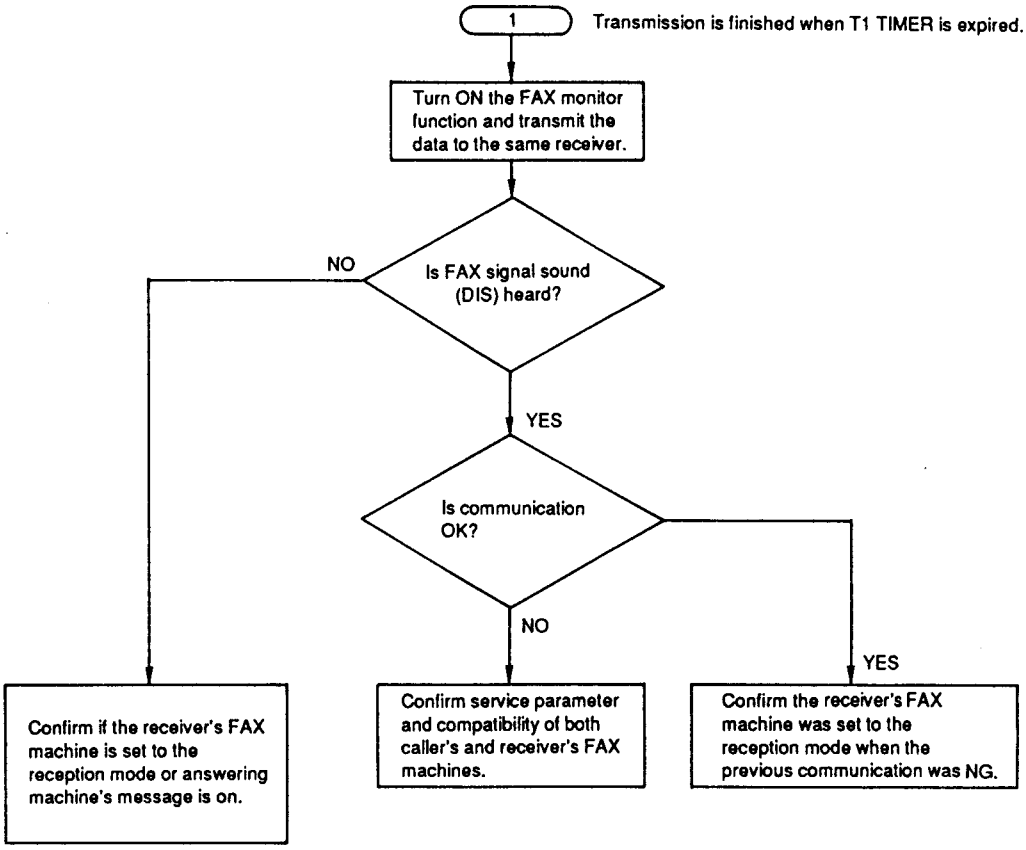
1. Press the PROGRAM button.
2. Press the #, 2 and 6 buttons.
3. Press the START button.
4. Print out.

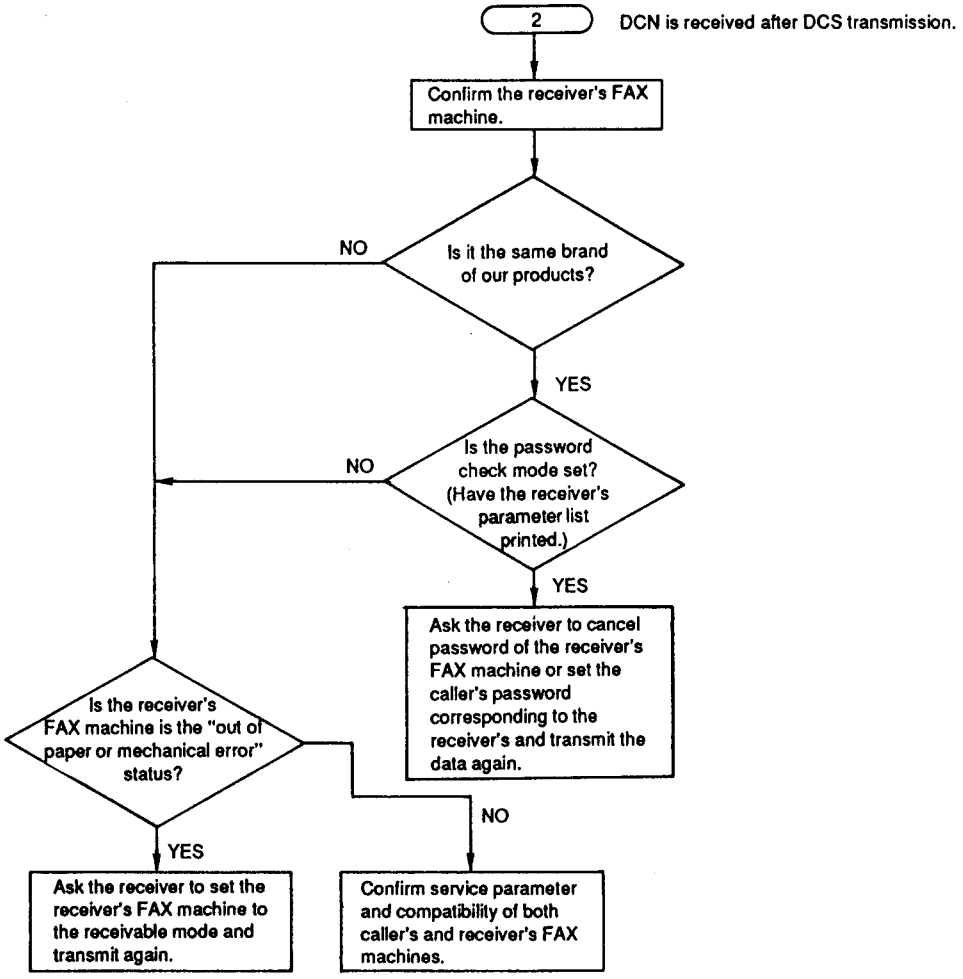
3-2. ERROR CORD TABLE

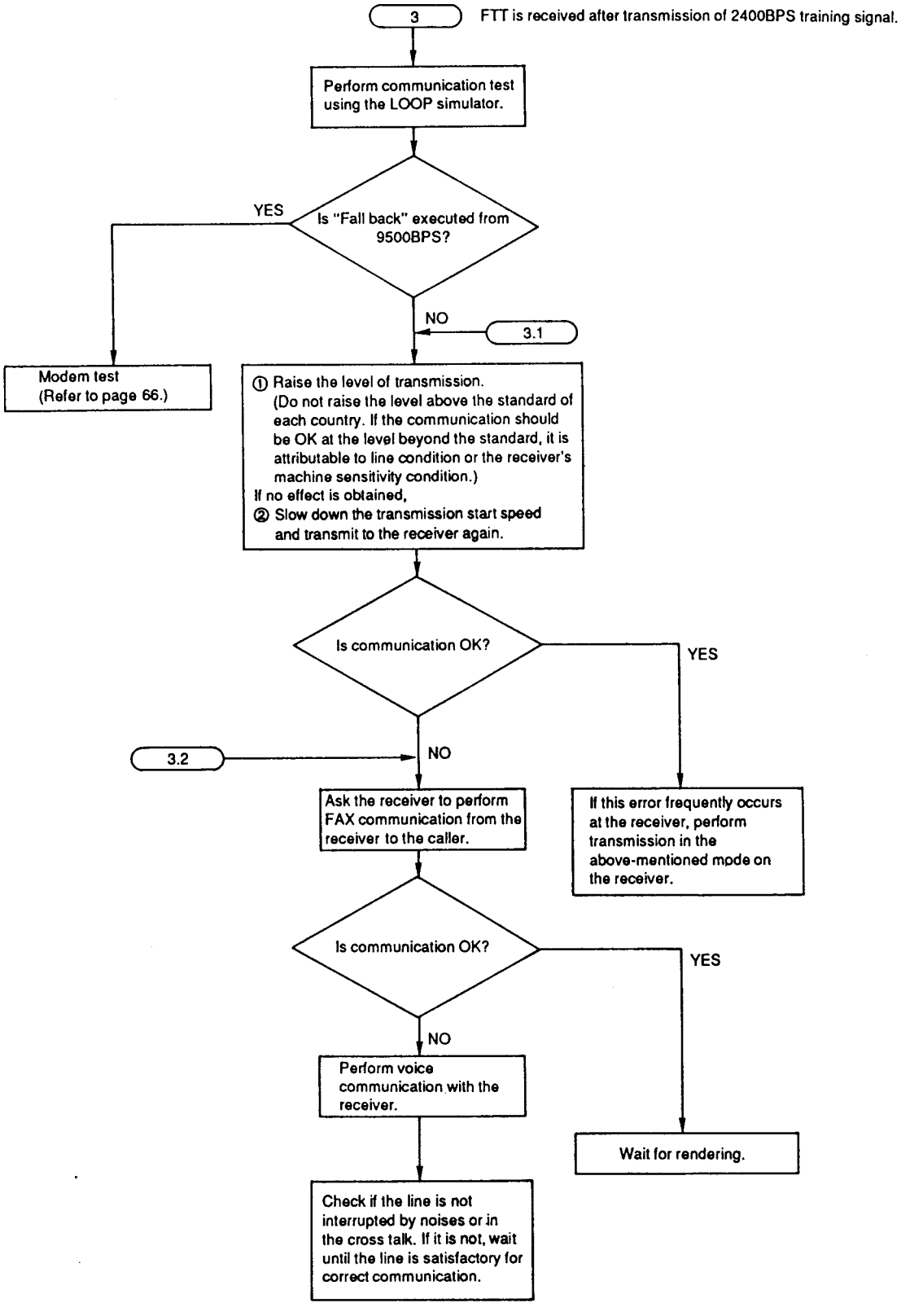
CODE	RESULT	Message on LCD	MODE	Symptom	Counter-measure
A2	PRESSED THE STOP KEY	E-02	TX & RX	Communication was interrupted with the STOP button	
A3	DOCUMENT JAMMED	E-03	TX	Document paper is jammed	
A4	NO DOCUMENT	E-03	TX	No document paper	
A5	PRINTER OVERHEATED	E-05	RX	Thermal head is overheated	
A6	PAPER OUT	E-06	RX	Out of thermal paper	
A7	THE COVER WAS OPENED	E-07	TX & RX	Cover is open	
A8	PAPER JAMMED	E-08	RX	Recording paper is jammed	
40	NO RESPONSE	E-04	TX	Transmission is finished when T1 TIMER is expired	1
41	COMMUNICATION ERROR	E-04	TX	DCN is received after DCS transmission	2
42	COMMUNICATION ERROR	E-04	TX	FTT is received after transmission of 2400BPS training signal	3
43	COMMUNICATION ERROR	E-04	TX	No response after post message is transmitted three times	4
44	COMMUNICATION ERROR	E-04	TX	PTN and PIN are received	5
46	COMMUNICATION ERROR	E-04	RX	No response after FTT is transmitted	6
48	COMMUNICATION ERROR	E-04	RX	No post message	7
49	COMMUNICATION ERROR	E-04	RX	RTN is transmitted	8
50	COMMUNICATION ERROR	E-04	RX	PIN is transmitted (to PRI-Q)	8
51	COMMUNICATION ERROR	E-04	RX	PIN is transmitted	8
52	NO RESPONSE	E-04	RX	Reception is finished when T1 TIMER is expired	9
53	COMMUNICATION ERROR	E-04	TX	DCN is received after transmission of NSC and DTC	10
54	COMMUNICATION ERROR	E-04	RX	DCN is received after DIS transmission	11
57	COMMUNICATION ERROR	E-04	TX	300BPS error	12
58	COMMUNICATION ERROR	E-04	RX	DCN is received after FTT transmission	13
59	COMMUNICATION ERROR	E-04	TX	DCN responds to post message	14
64	COMMUNICATION ERROR	E-04	TX	Polling is not possible	15
67	PASSCODE FAILED	E-09	TX & RX	Password is incorrect	16
68	COMMUNICATION ERROR	E-04	RX	No response at the other party after MCF or CFR is transmitted	13
70	COMMUNICATION ERROR	E-04	RX	DCN is received after CFR transmission	13
72	COMMUNICATION ERROR	E-04	RX	Carrier is cut when image signal is received	17
FF	COMMUNICATION ERROR	E-04	TX & RX	Modem error	12

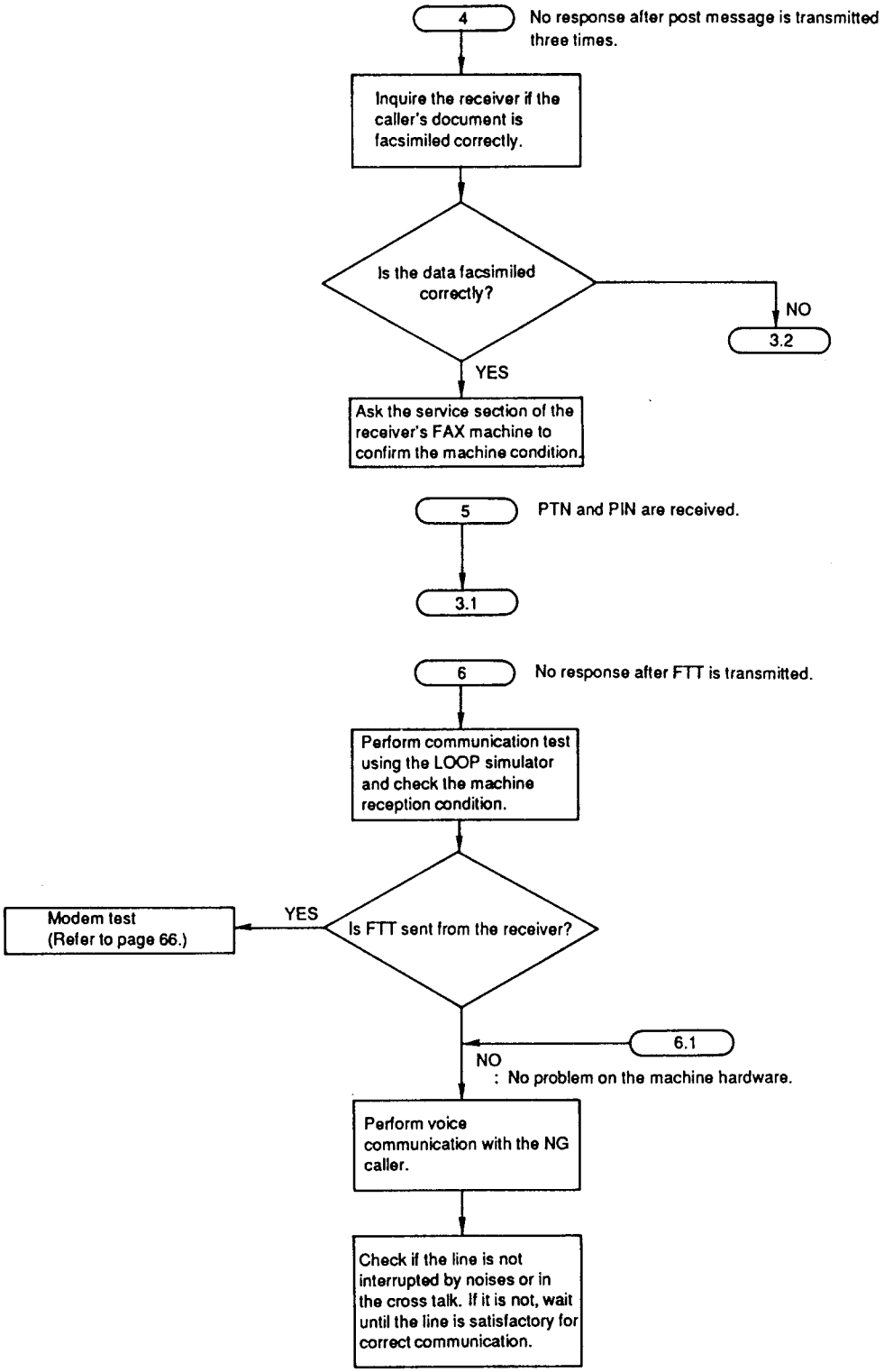
TX=TRANSMISSION RX=RECEPTION

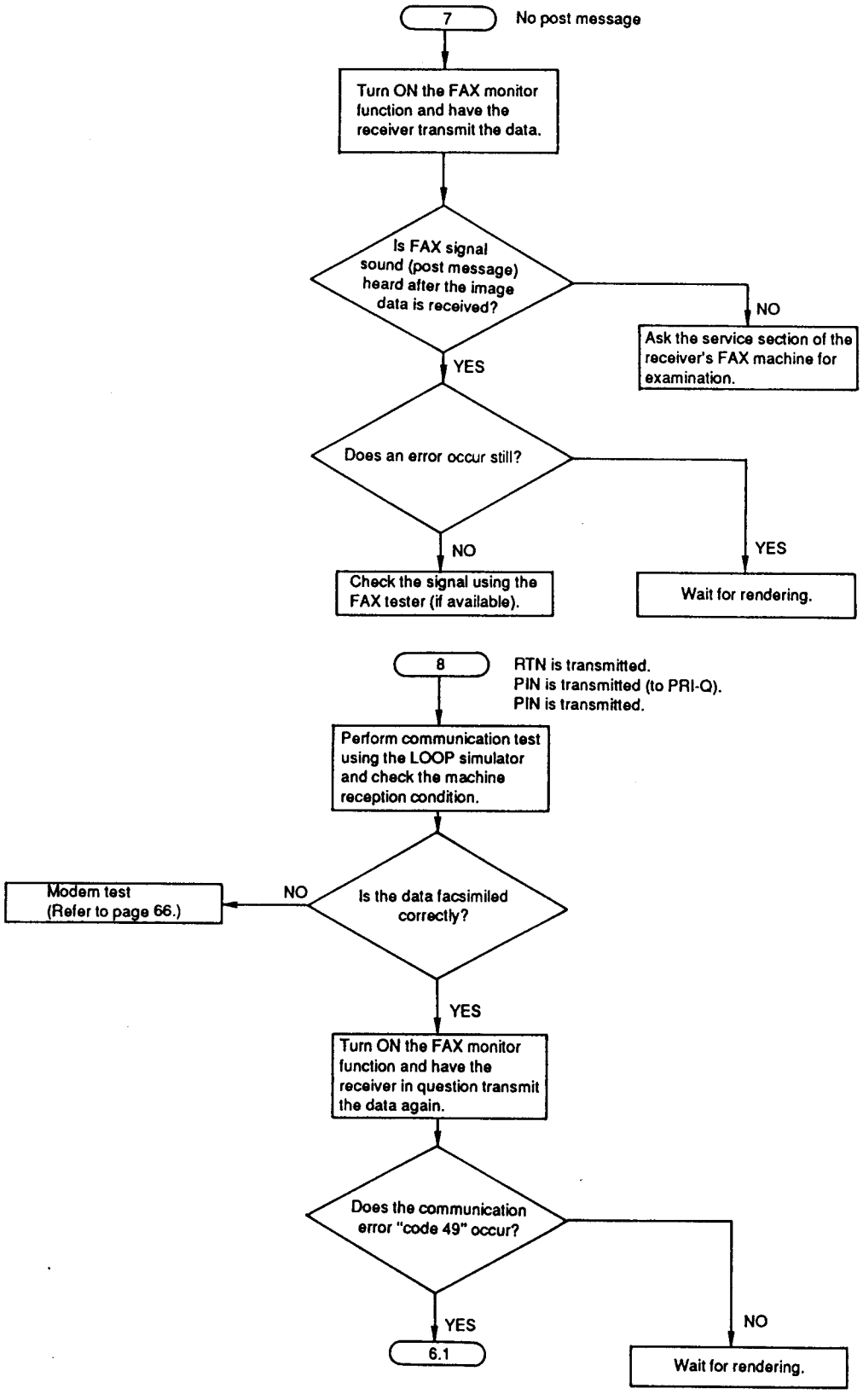
3-3. COUNTERMEASURE

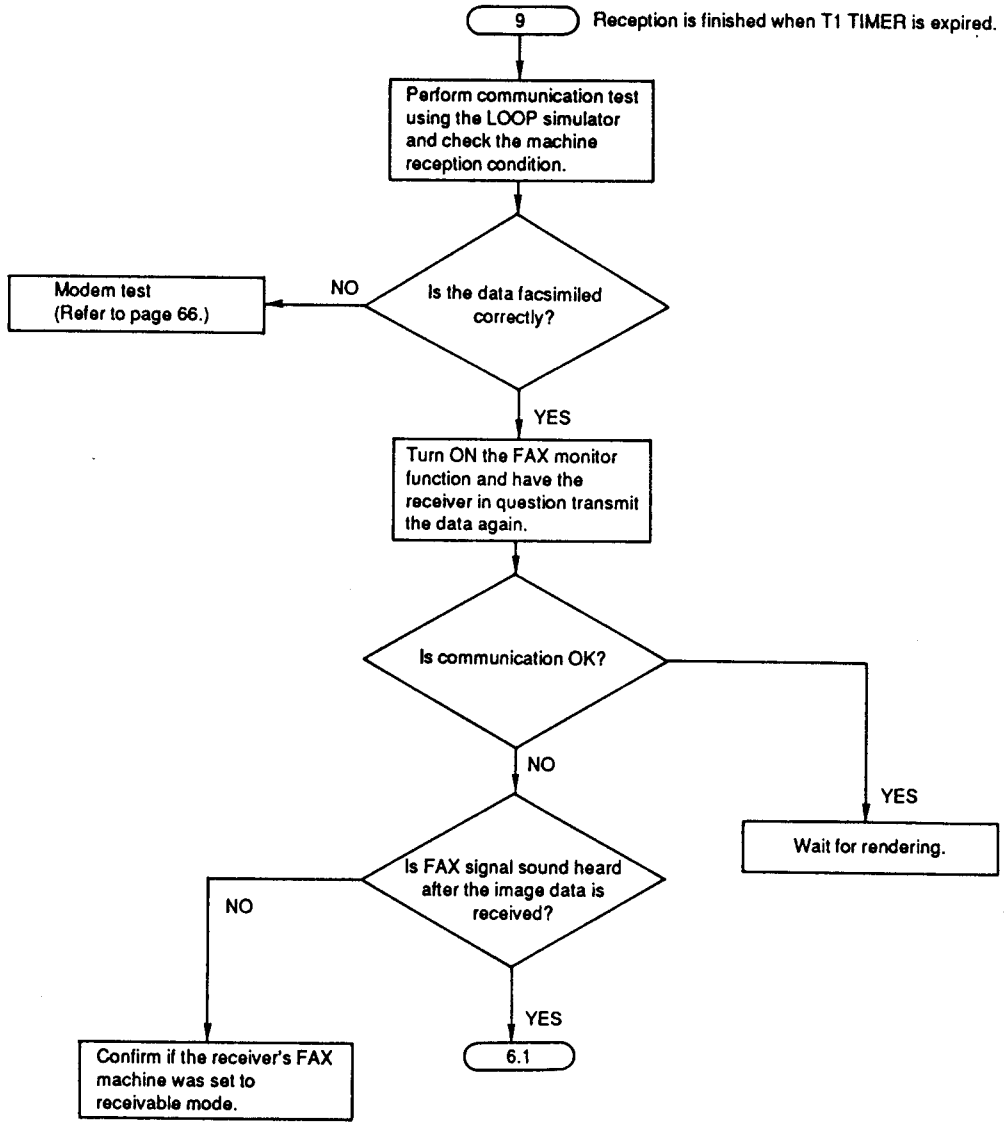


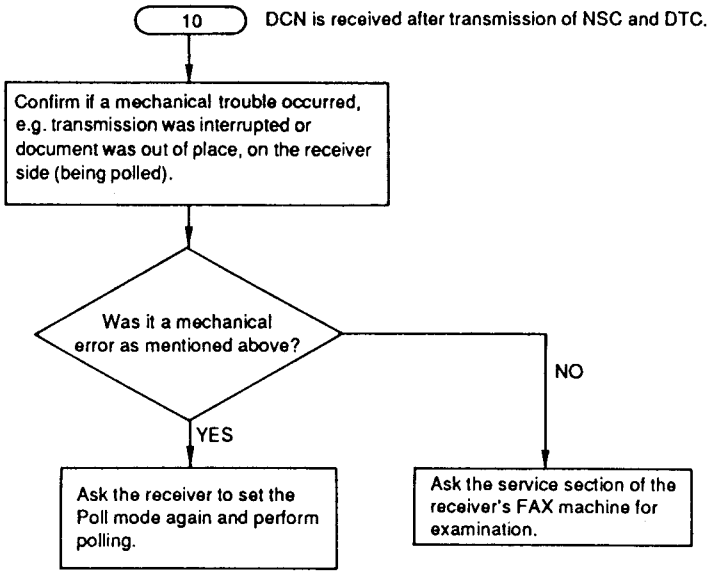


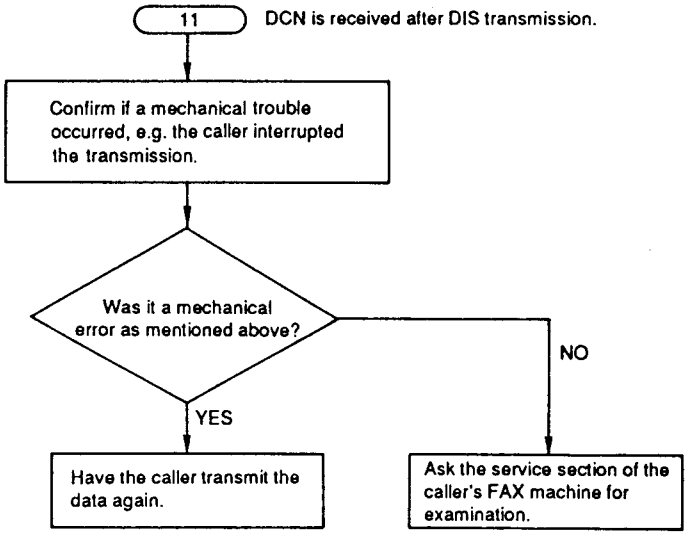


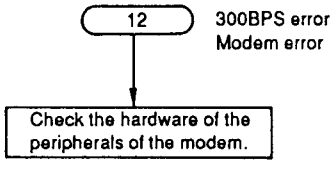


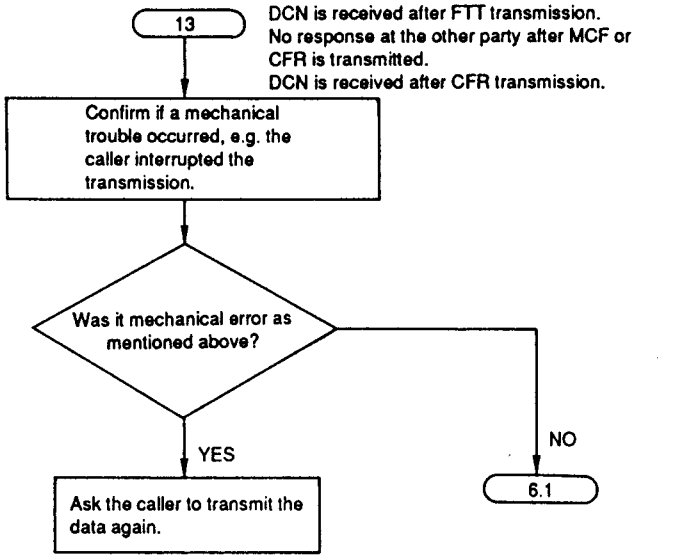


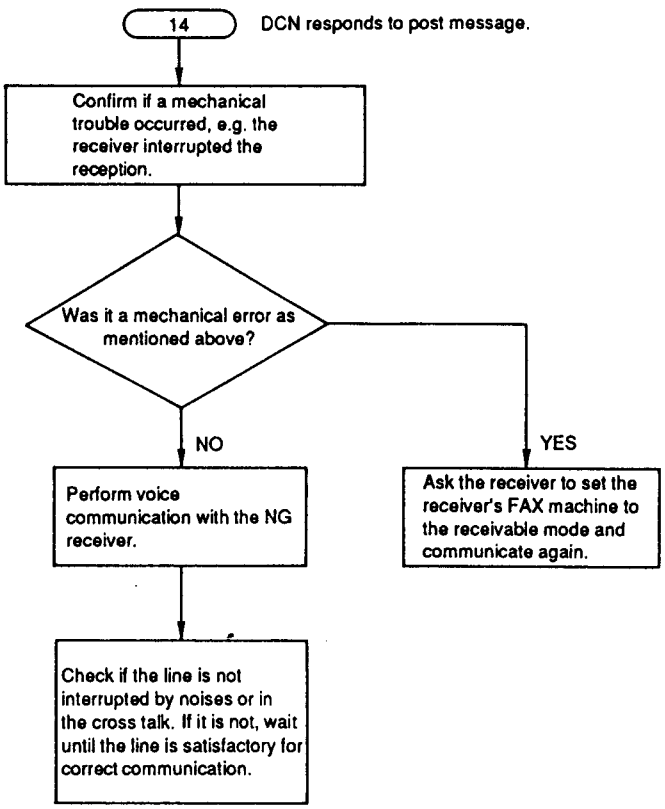


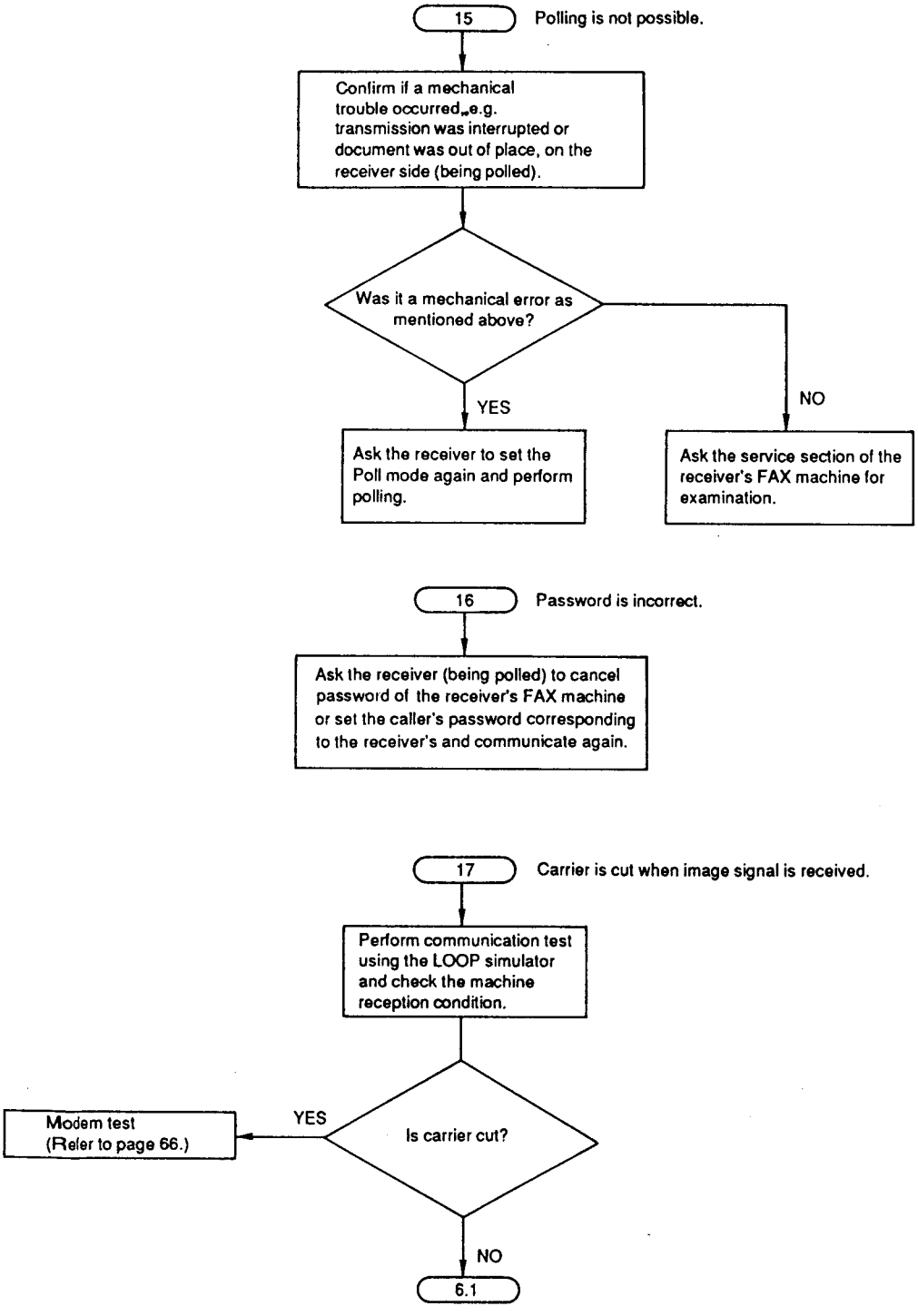










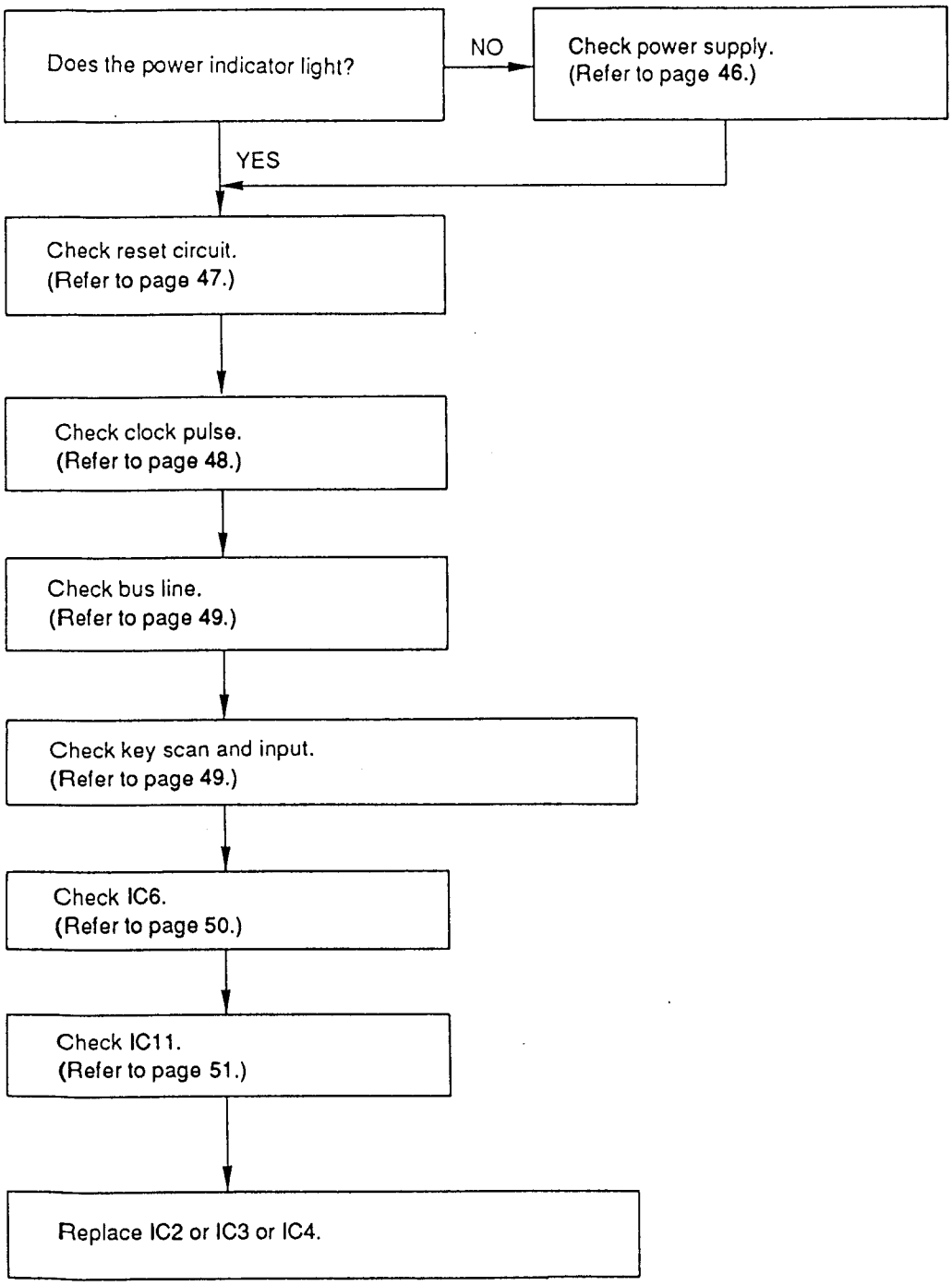


4. SERVICE HINTS

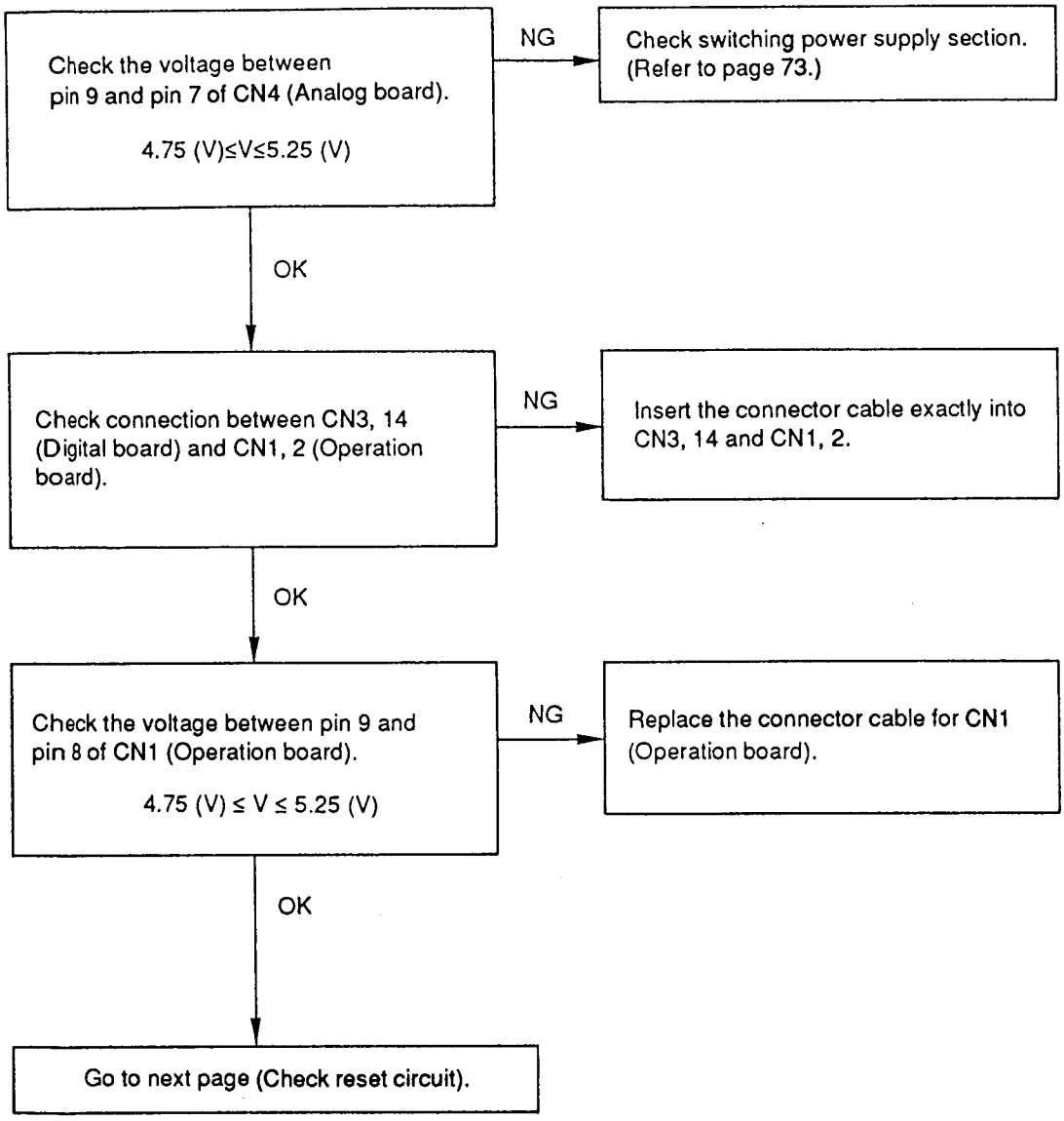
SYMPTOM	CURE
1. Defective general ATAS/ITS operation	Defective solder on IC15 or check for solder short.
1) Defective OGM record/playback	Check IC7→IC14→IC11.
2) Does not pull the plunger.	Check Q27 and Q29.
3) Holds line constantly.	Check Q1, PC4 and SA1.
4) ICM will not be cut off.	Check R86, R124, C106 and C108.
5) Does not rewind.	Check Q22, Q23 and Q24.
6) Does not fast forward.	Check Q20.
2. Other defective operation	Defective solder on IC6 or IC11, check for solder short. (Refer to pages 50 and 51.)

5. GENERAL

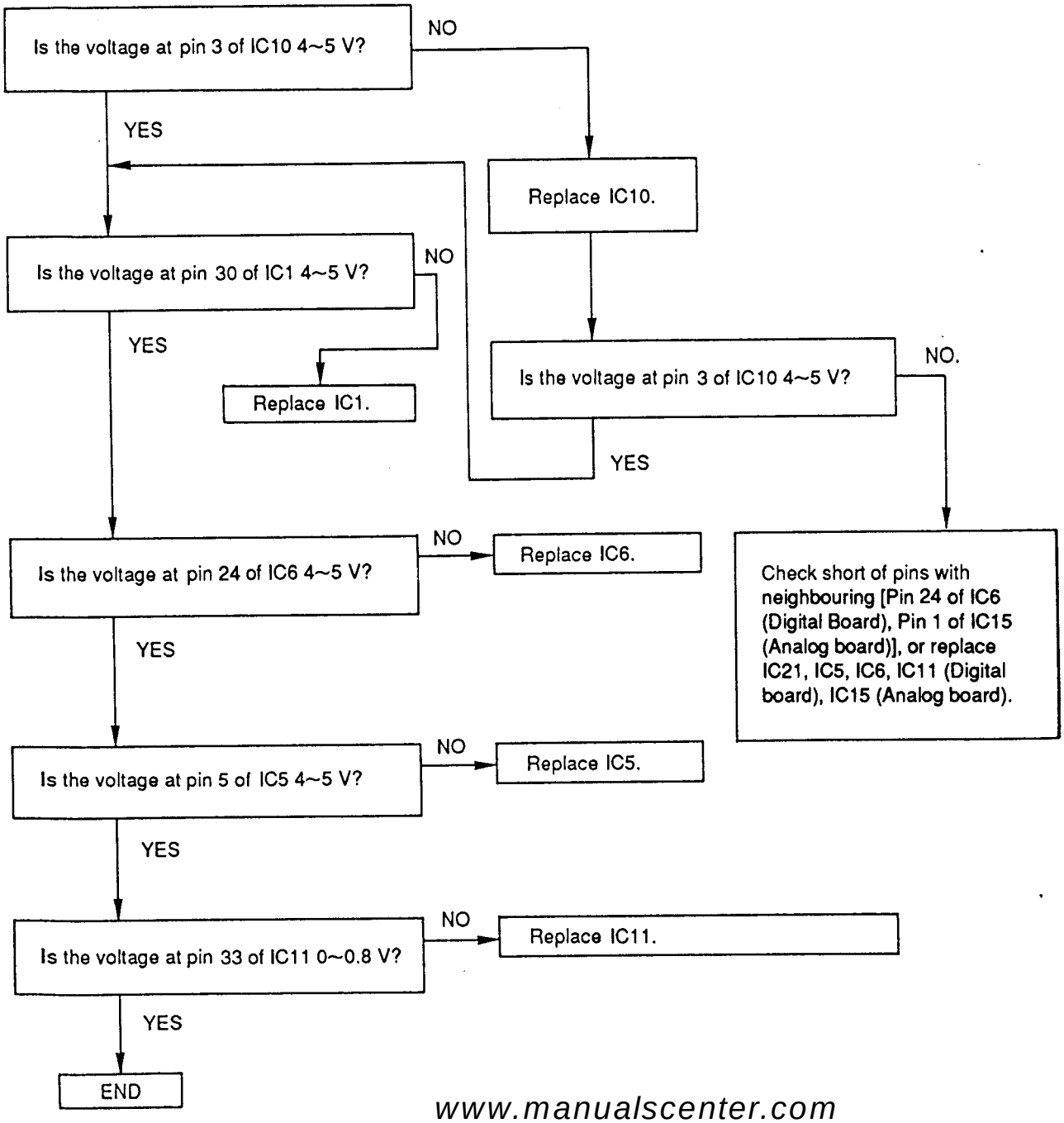
5-1. UNIT DOES NOT WORK



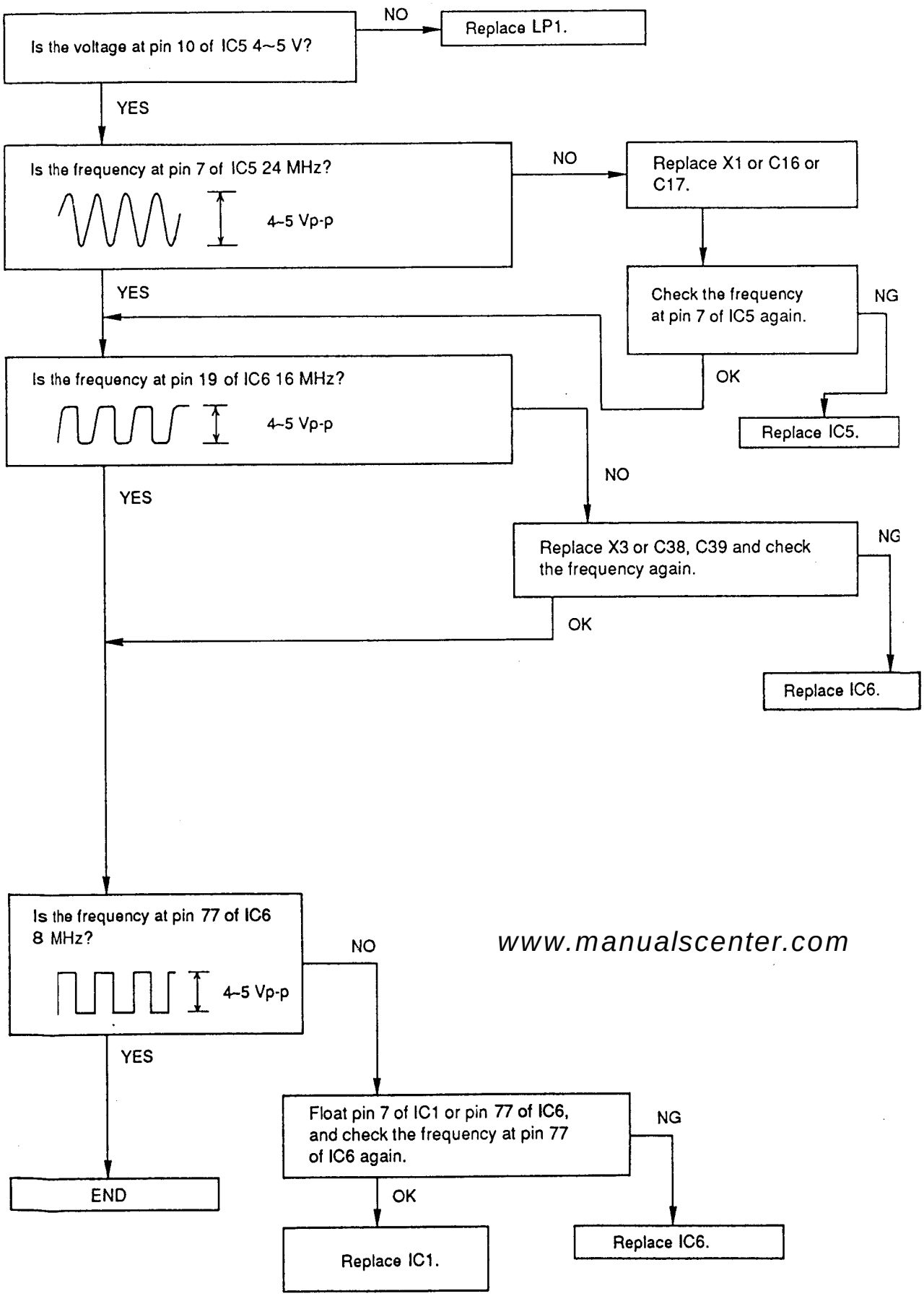
Note 1) Check power supply



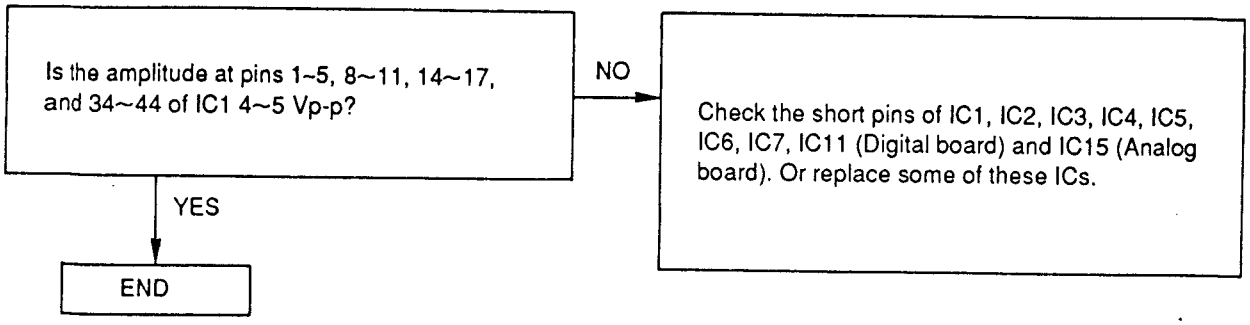
Note 2) Check reset circuit



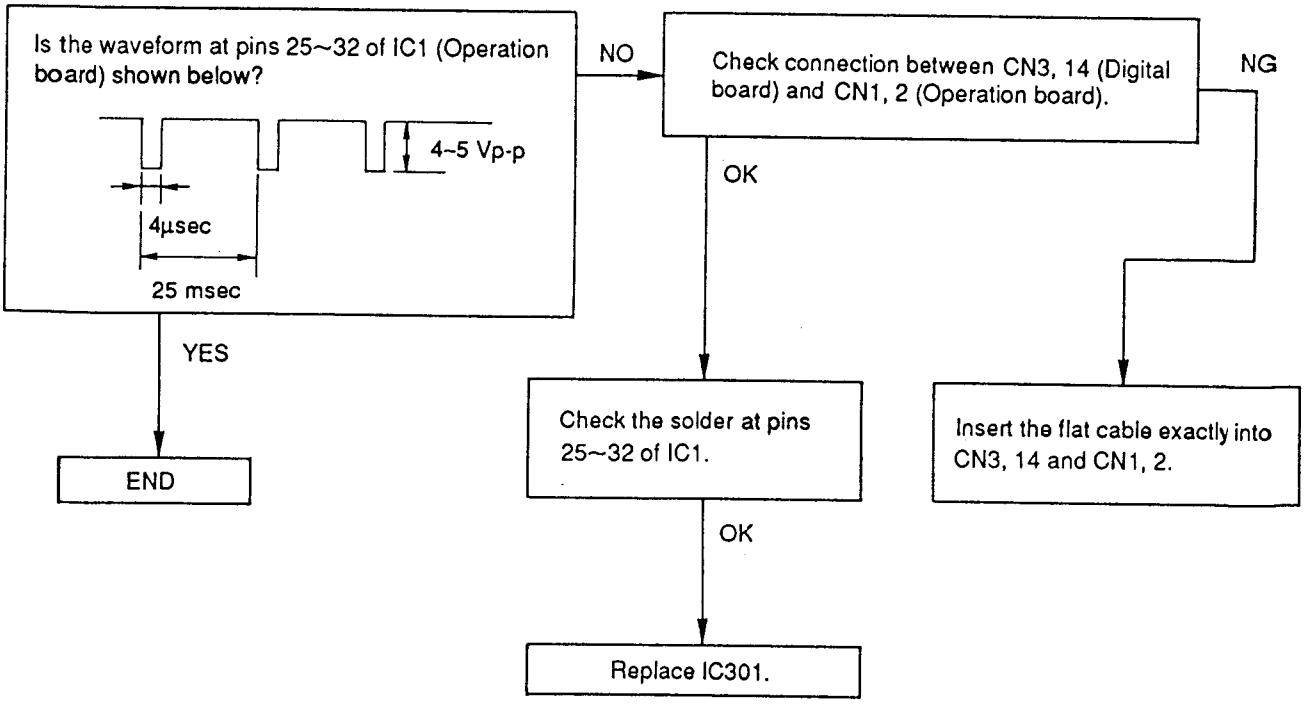
Note 3) Check clock pulse



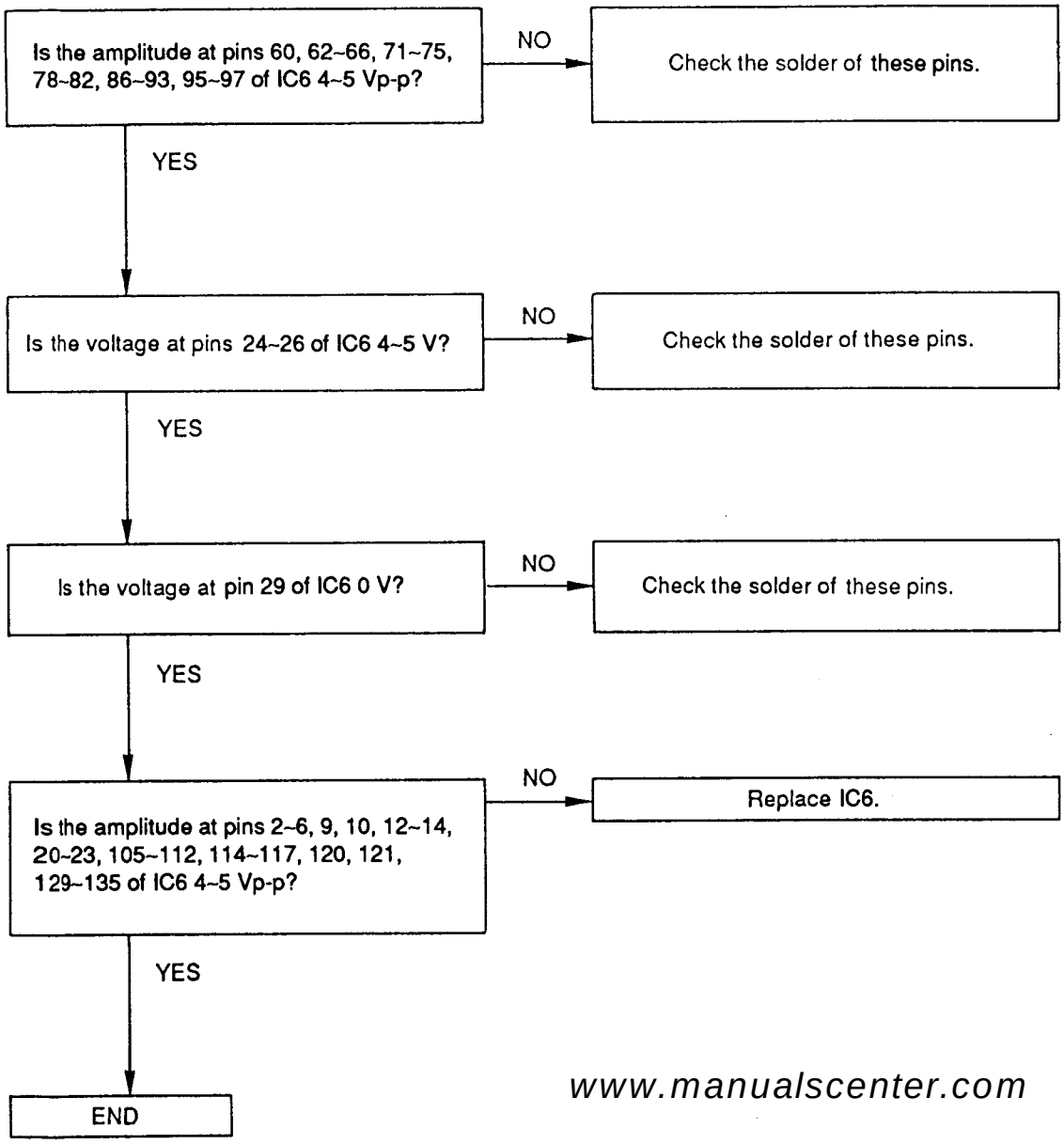
Note 4) Check bus line



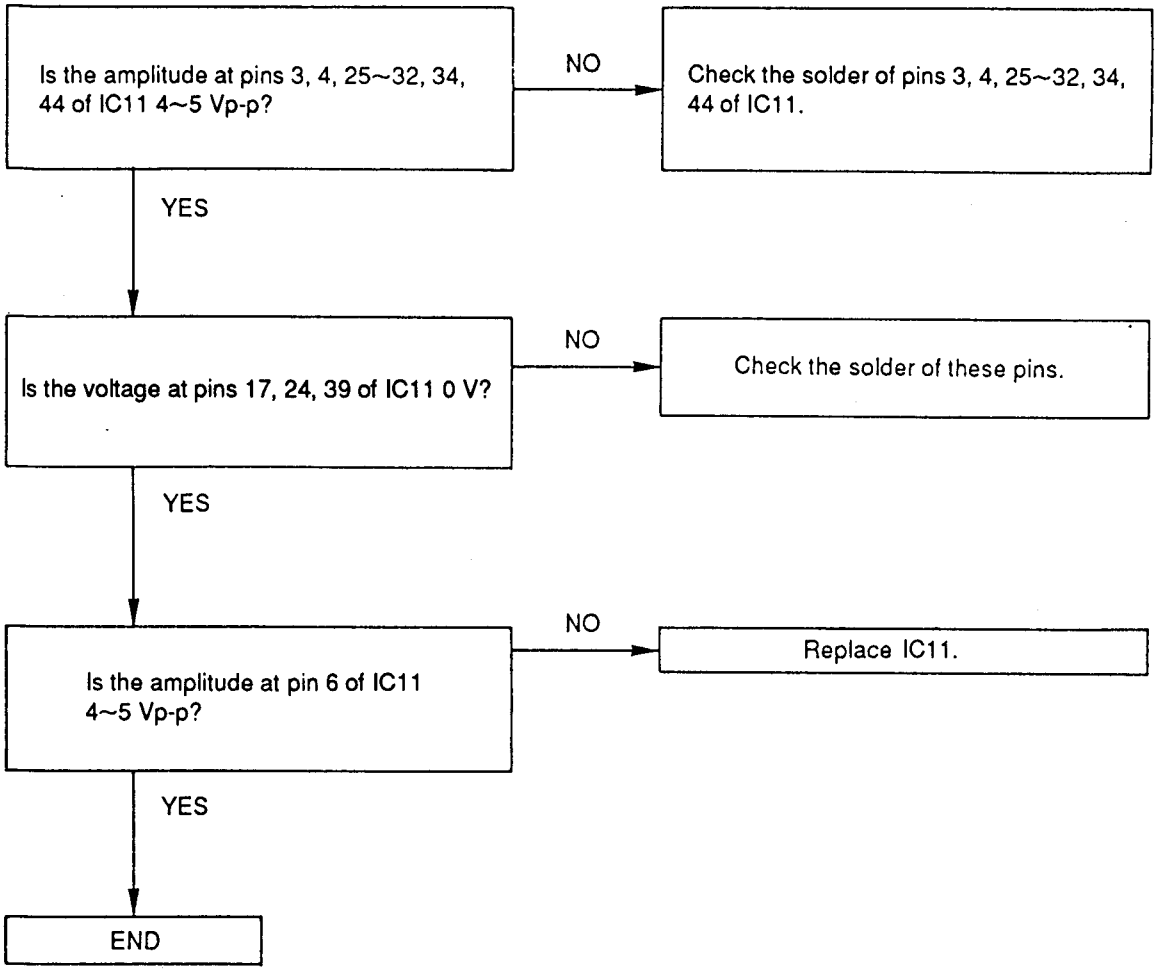
Note 5) Check key scan and input



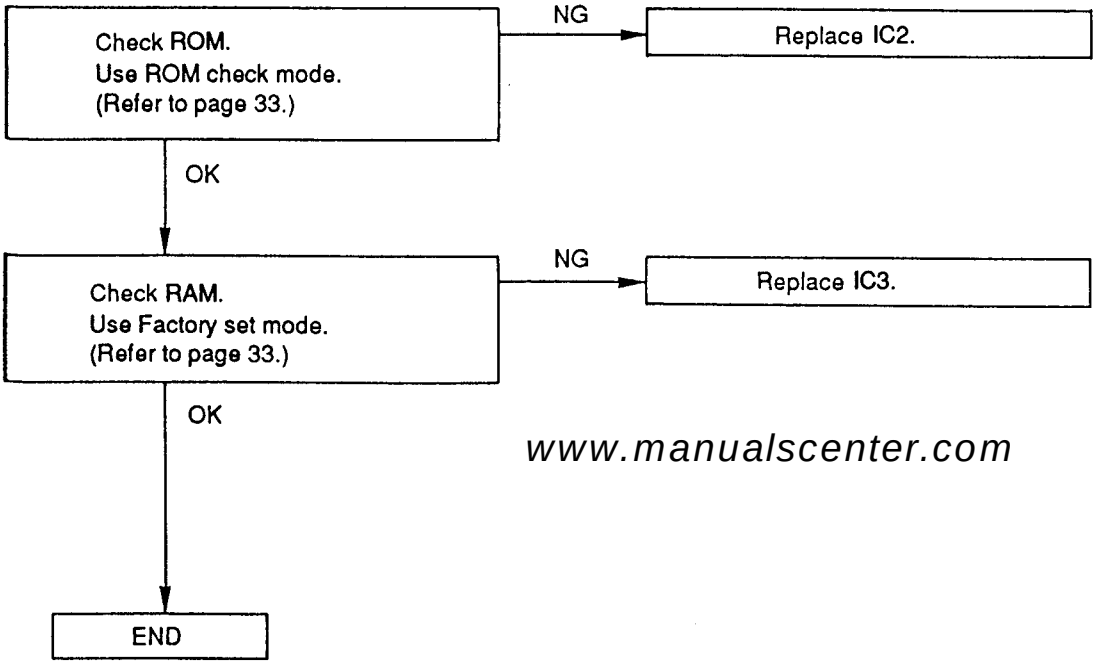
Note 6) Check IC6 (Digital Board)



Note 7) Check IC11 (Digital Board)

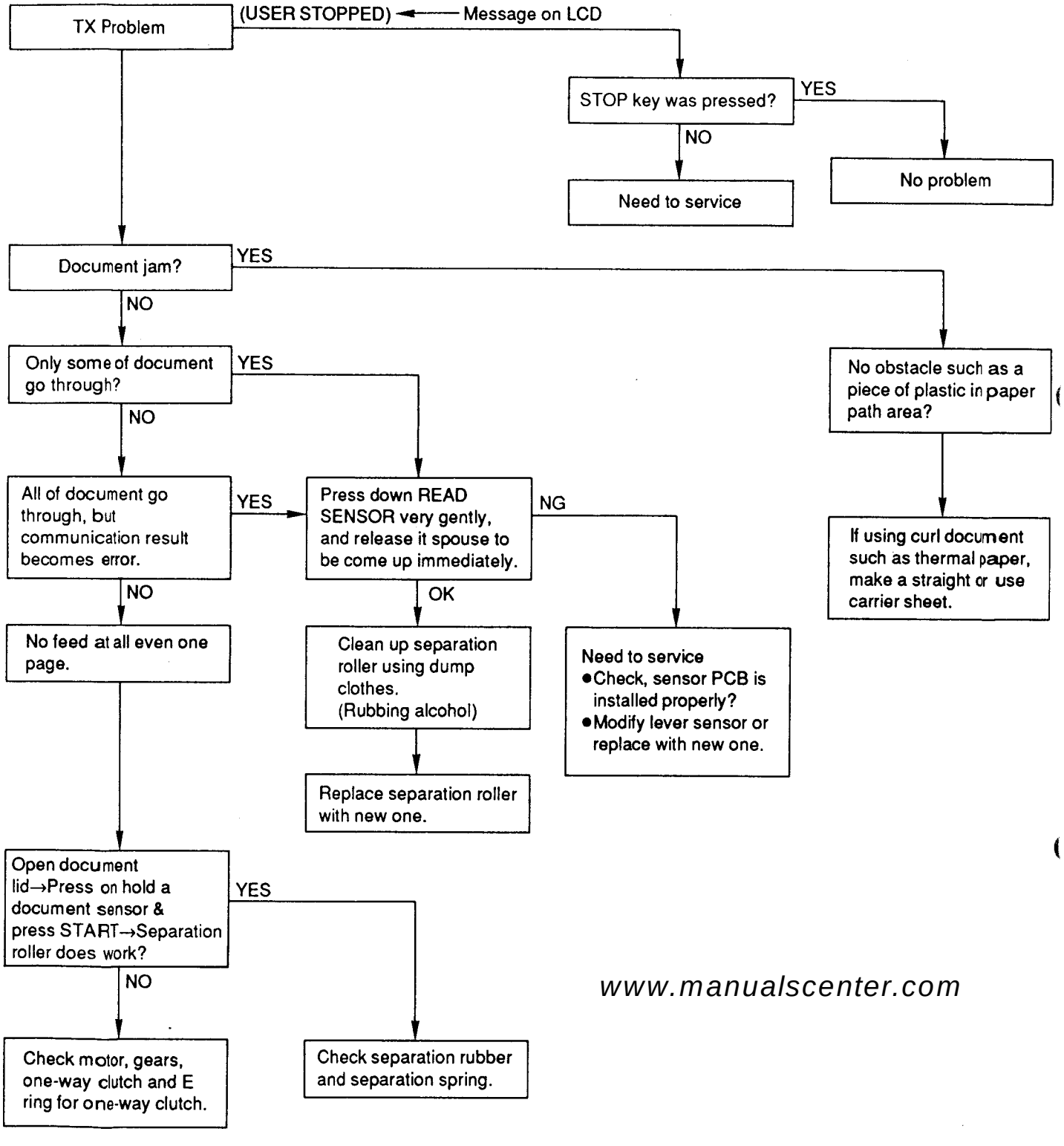


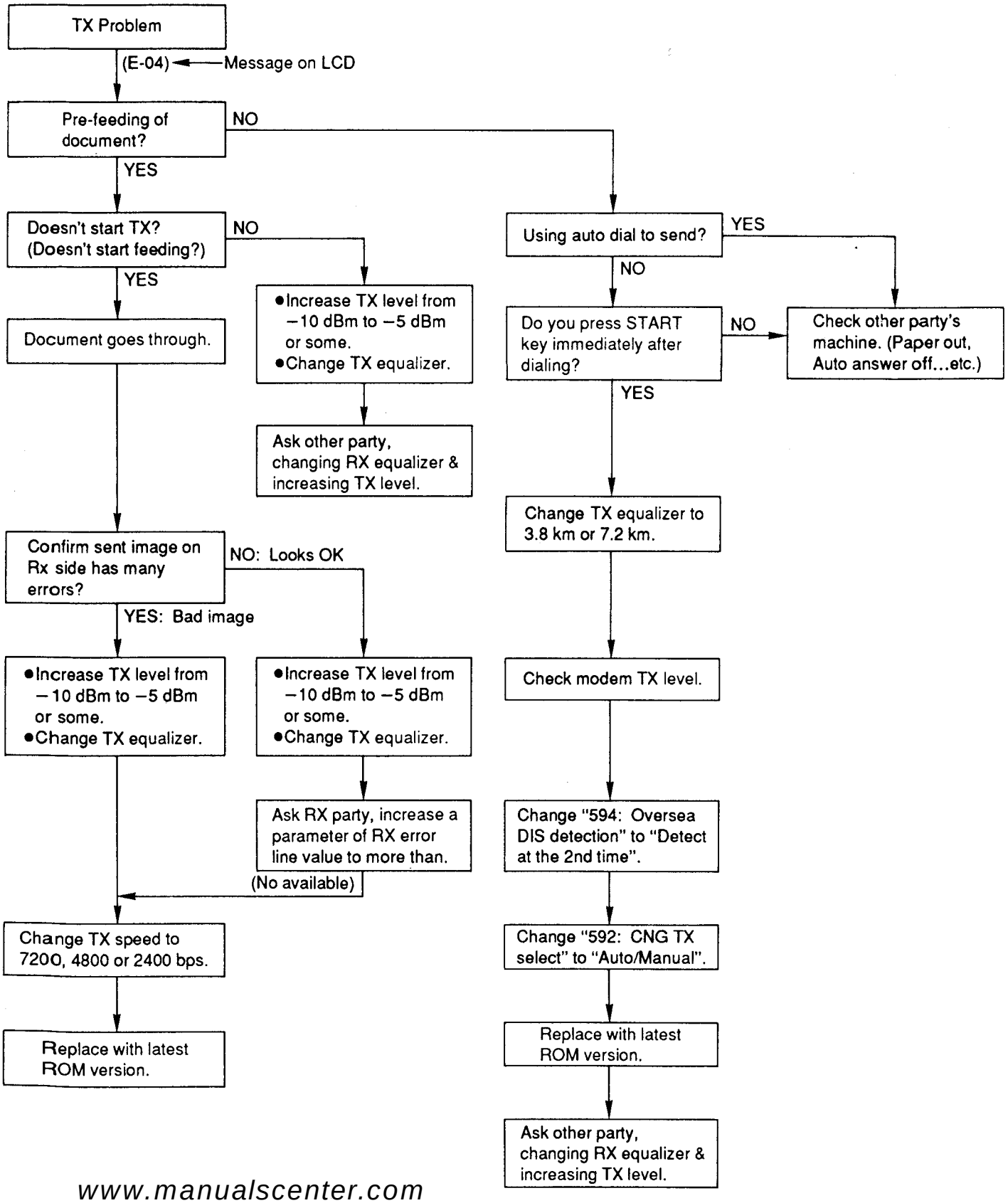
5-2. SOME FUNCTIONS WORK, BUT OTHERS DO NOT



6. DEFECTIVE FACSIMILE SECTION

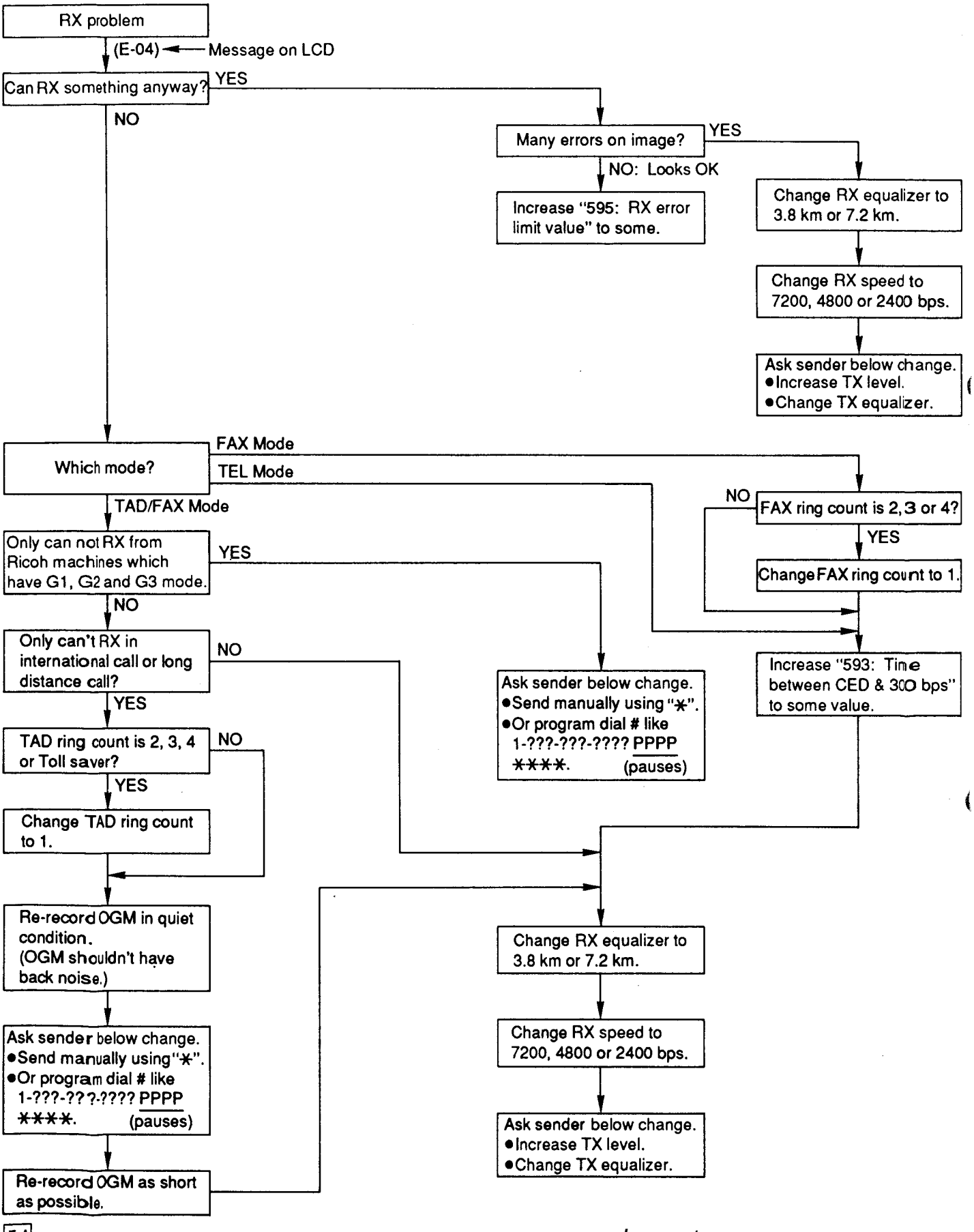
6-1. TRANSMIT PROBLEM



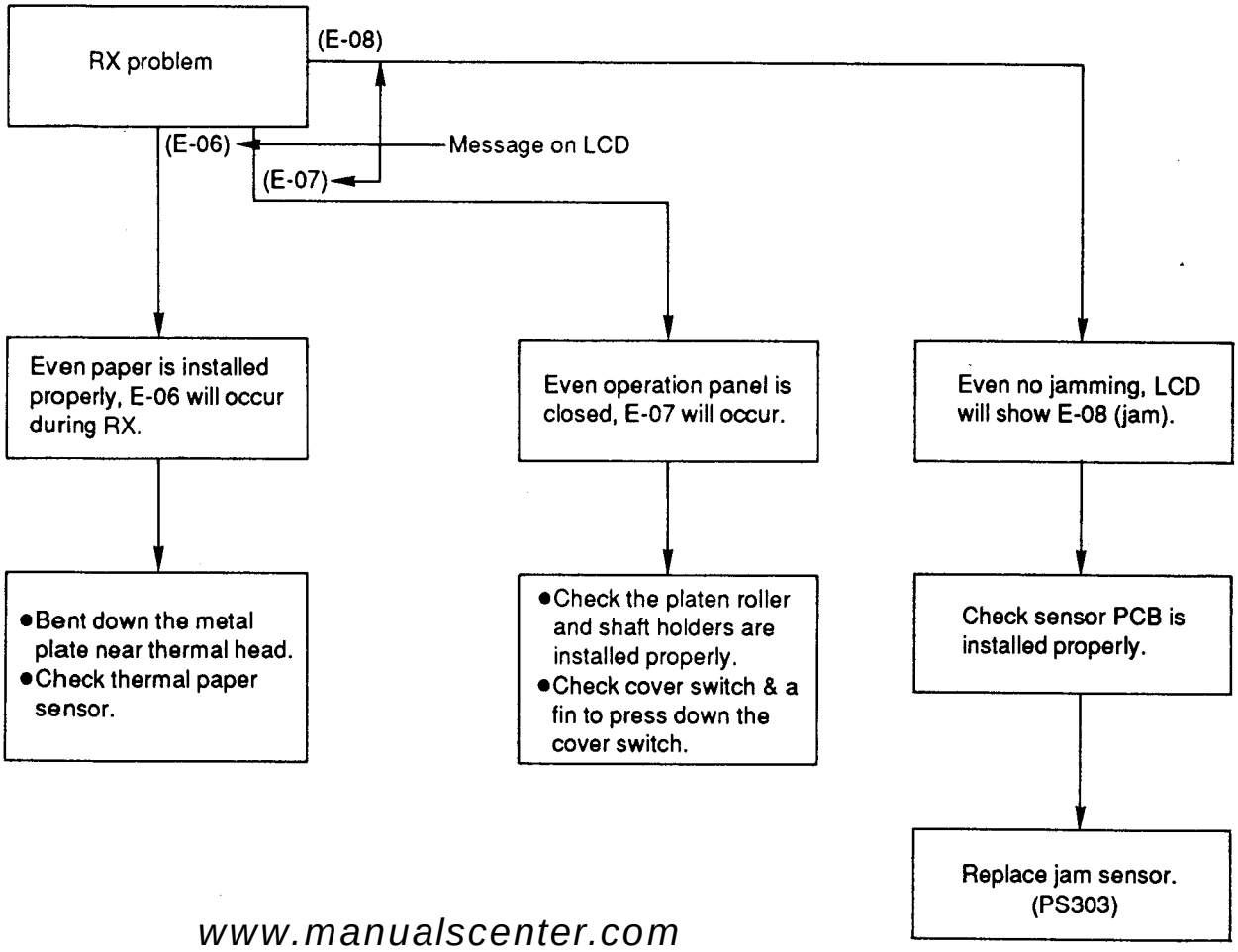


6-2. RECEIVE PROBLEM

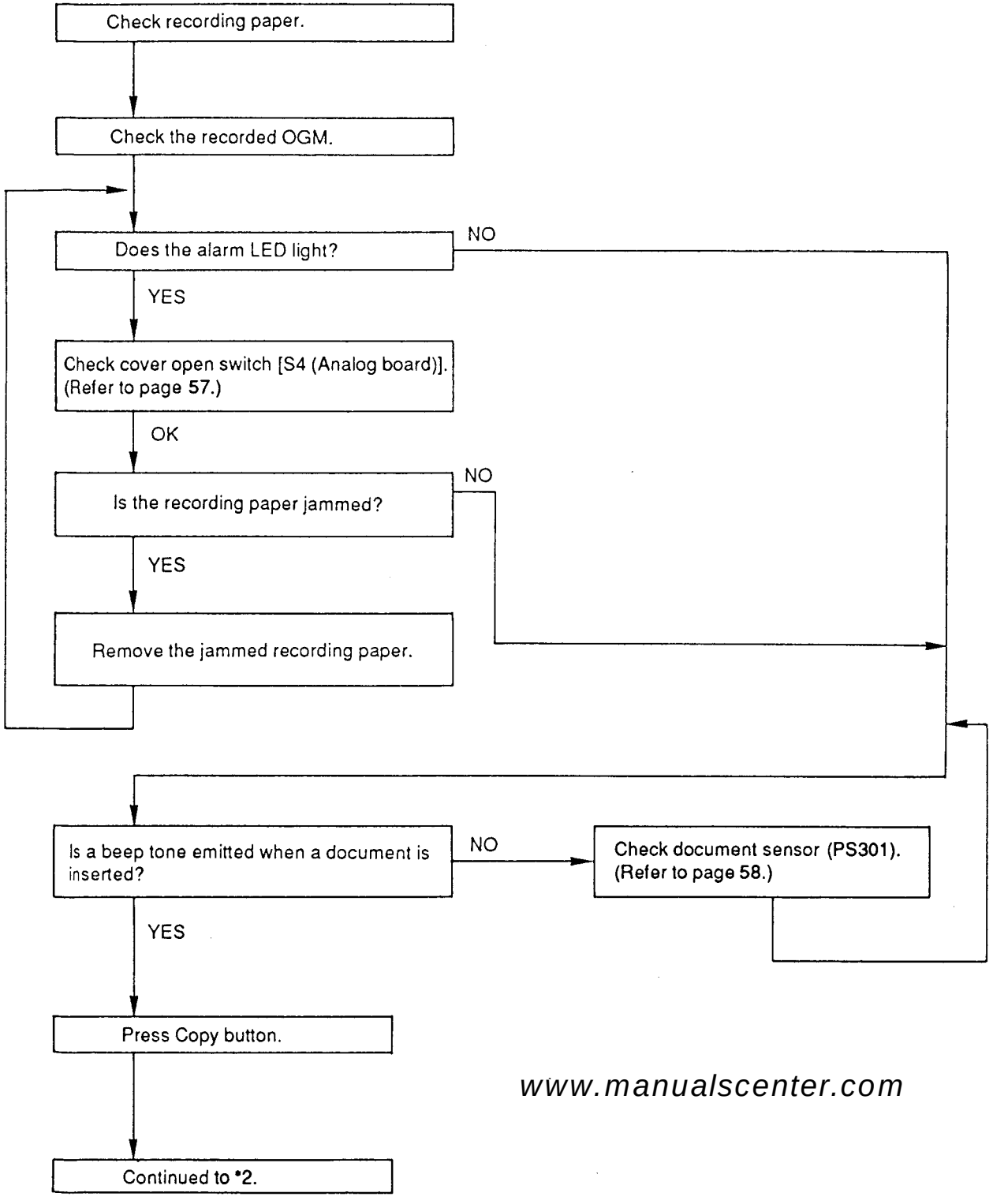
Confirm below before starting troubleshooting.
- Recording paper is installed properly?
- Remote fax ID is "OFF"?

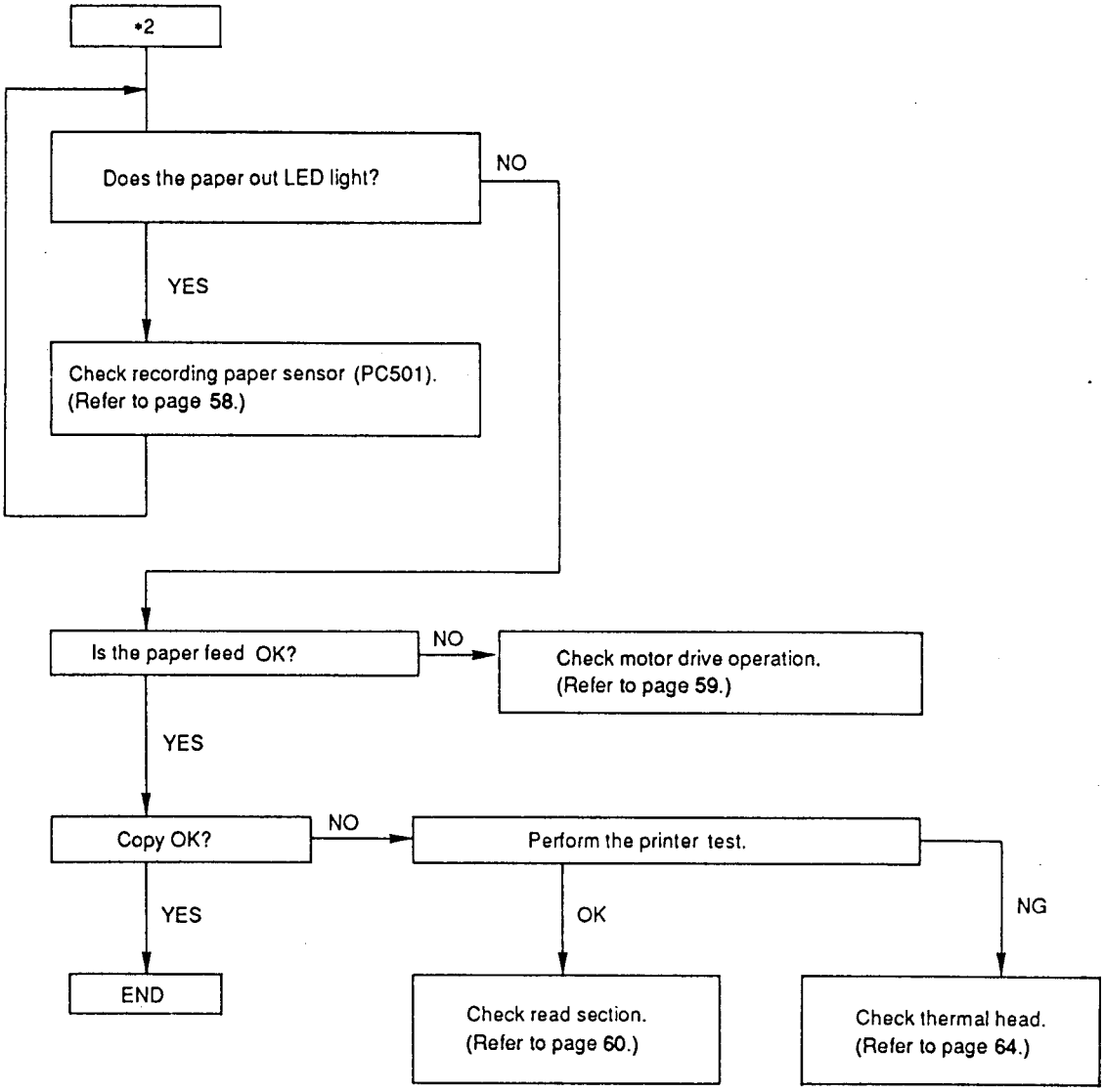


Confirm below before starting troubleshooting.
- Recording paper is installed properly?
- Remote fax ID is "OFF"?

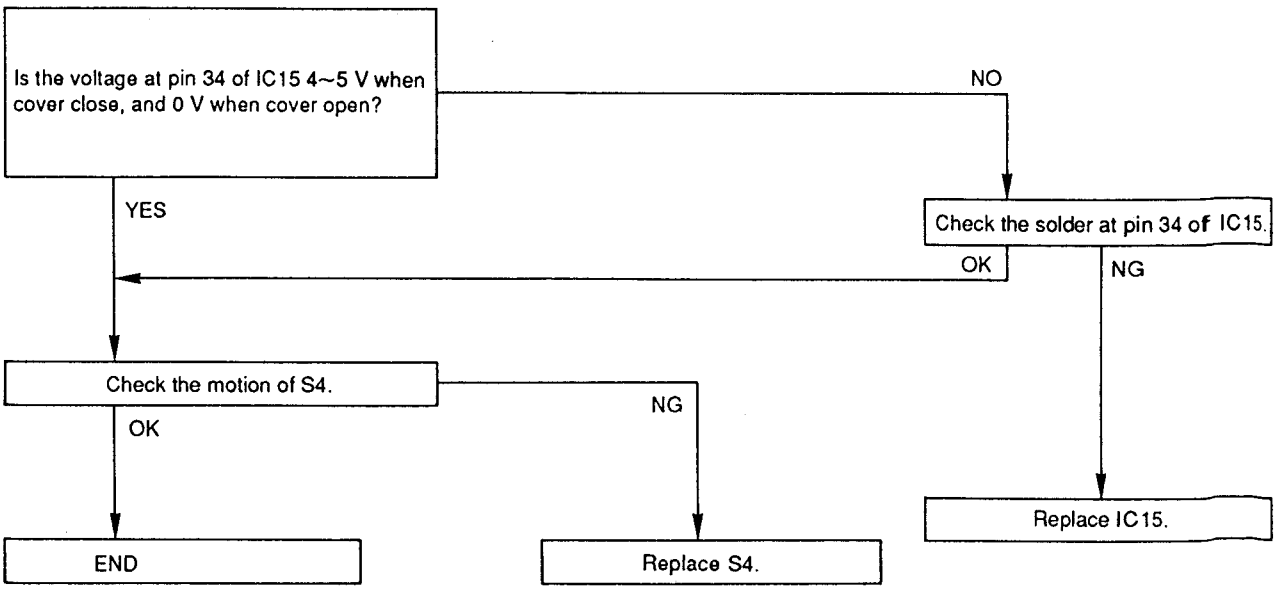


6-3. DOES NOT COPY OR COPY IMAGE IS INCORRECT AND DOES NOT TRANSMIT OR RECEIVE

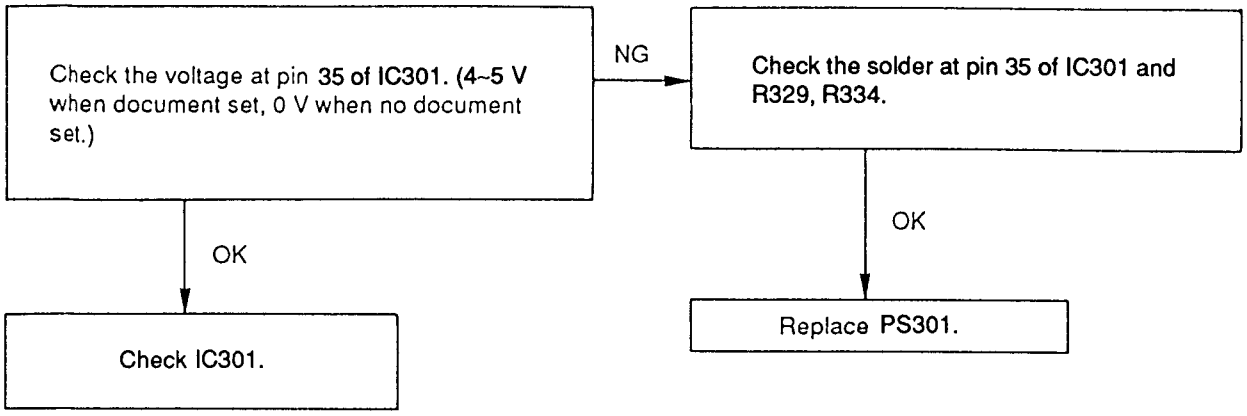




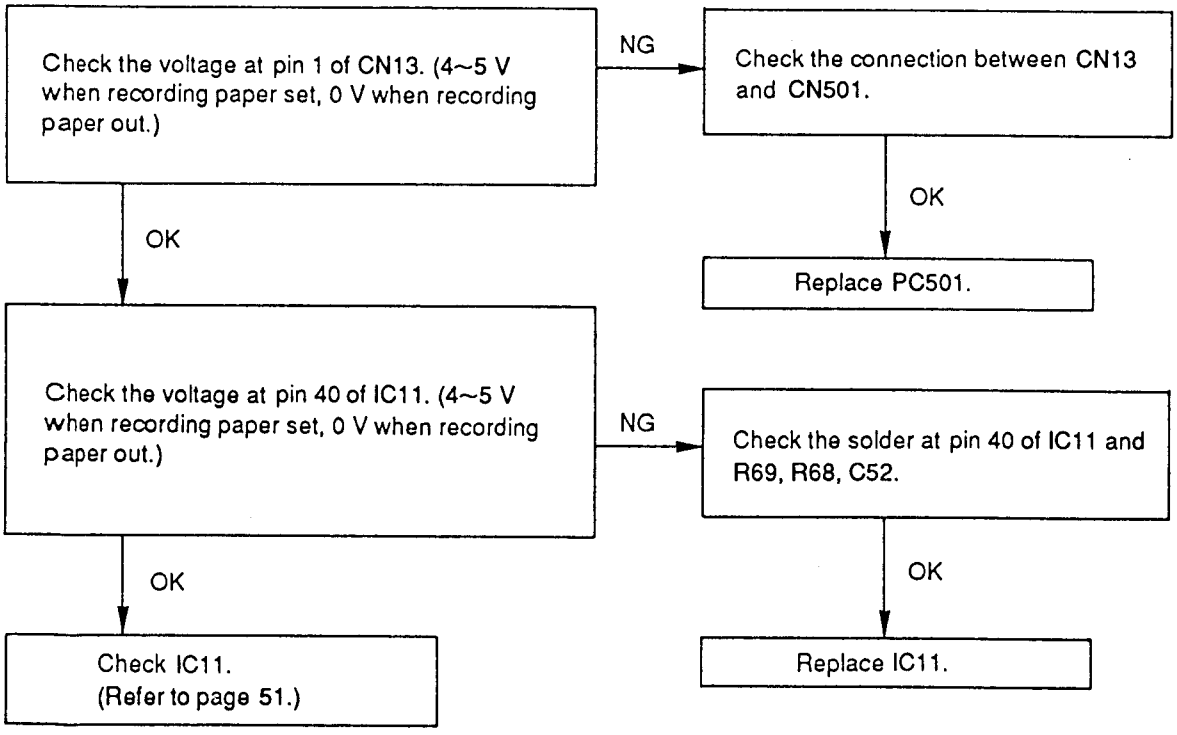
Note 1) Check cover open switch (S4) (Analog Board)



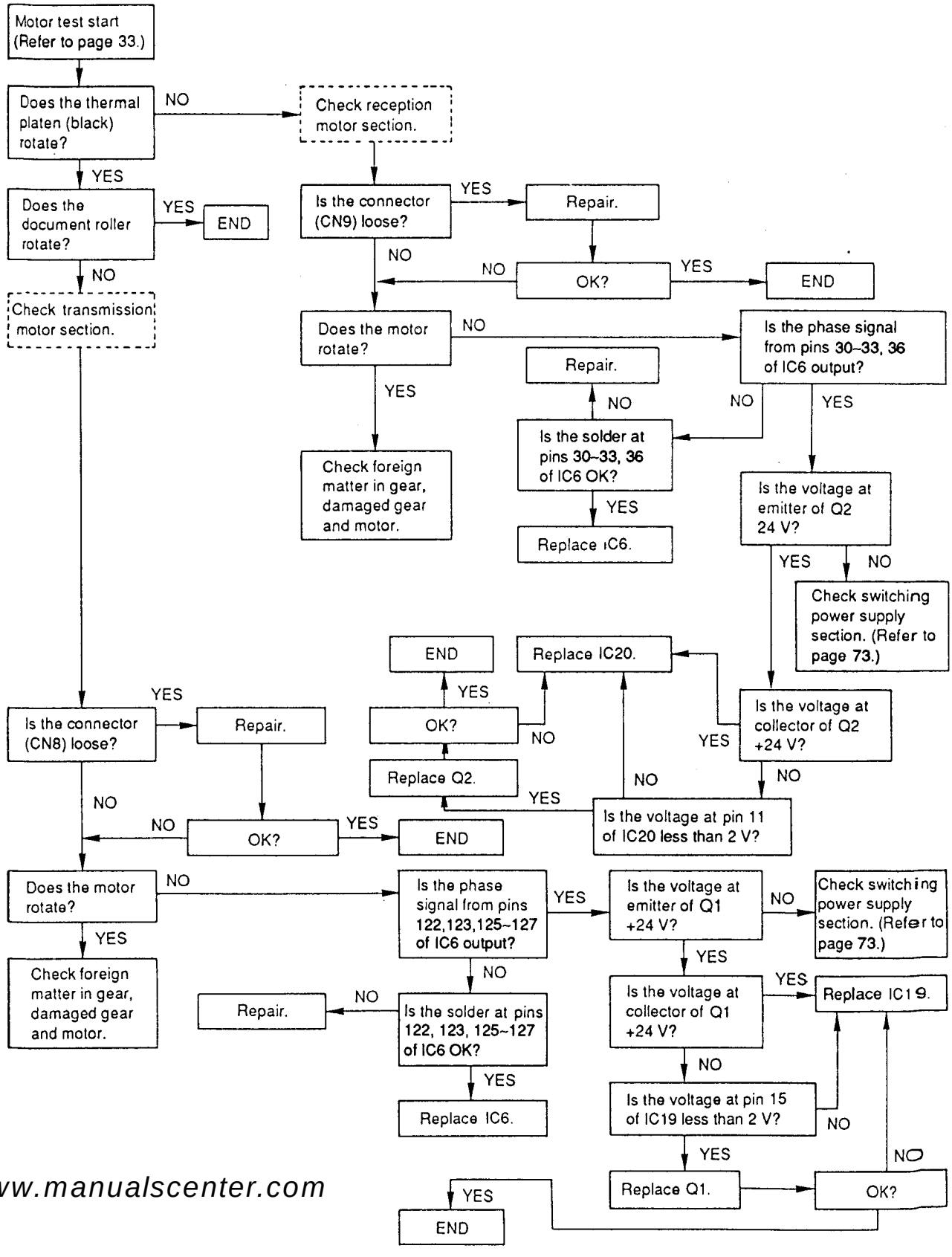
Note 2) Check document sensor (PS301) (Operation Board)



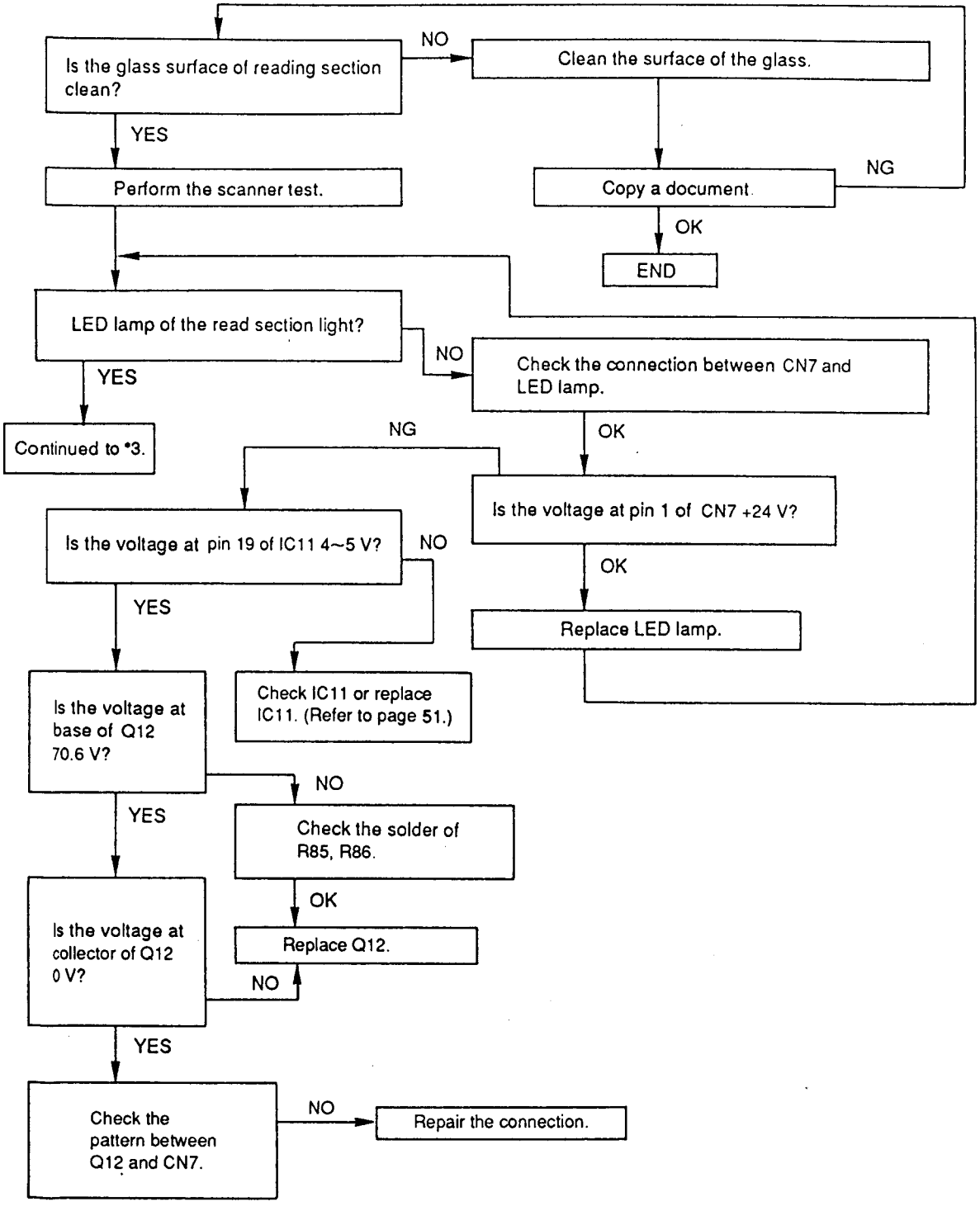
Note 3) Check recording paper sensor (PC501) (Sensor Board)

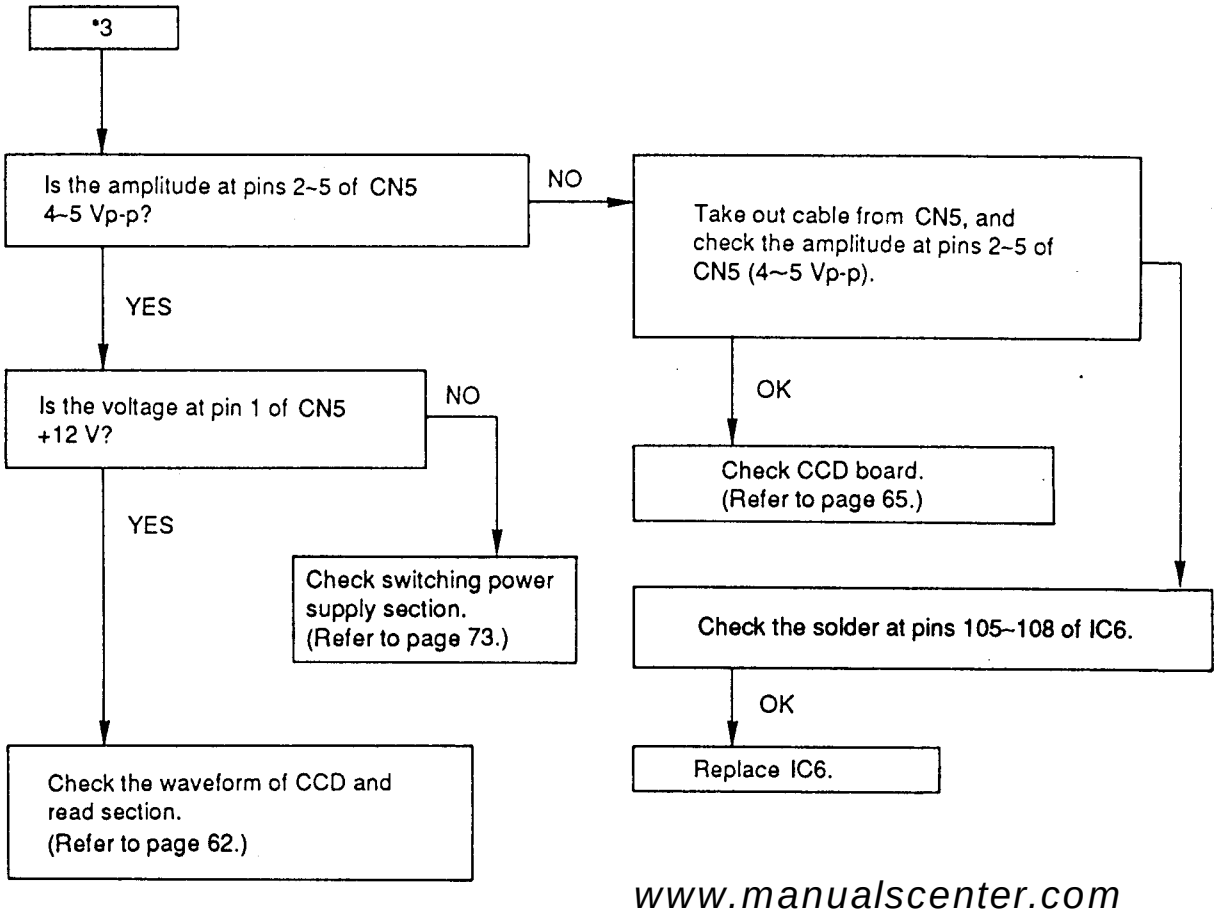


Note 4) Check motor drive operation

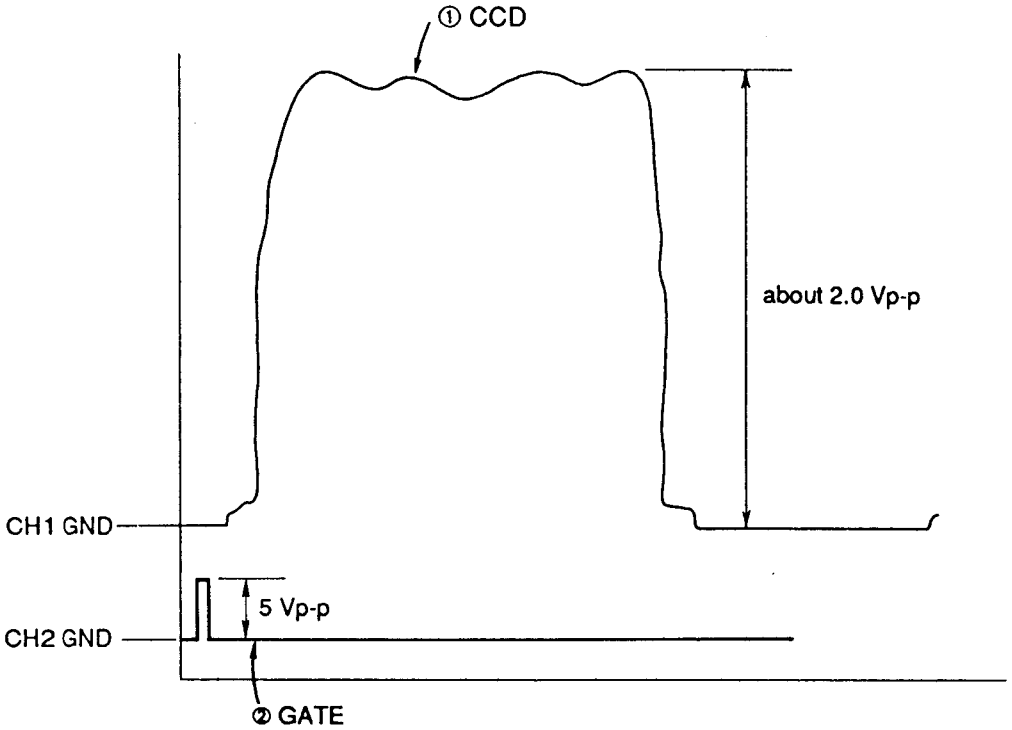


Note 5) Check read section





Waveform of read section



Oscilloscope setting

V: CH1 0.5 V/div
CH2 5 V/div
DC couple, CHOP mode

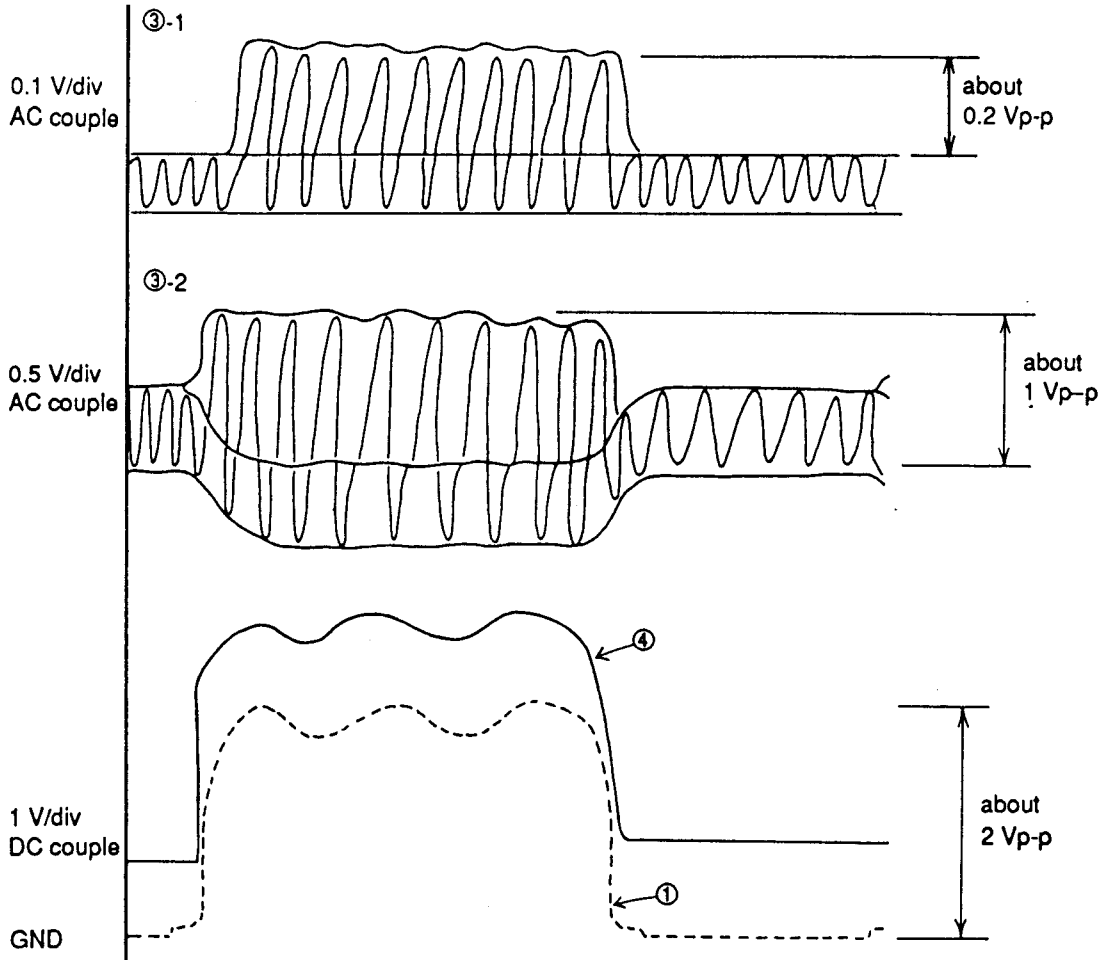
H: 1 msec / div

Trigger: CH2 SLOPE (+)

Probe point: GND Test point 1 "TP1 AG"
CH1 Test point "TP2 CCD"
CH2 Test point "TP3 FTG"

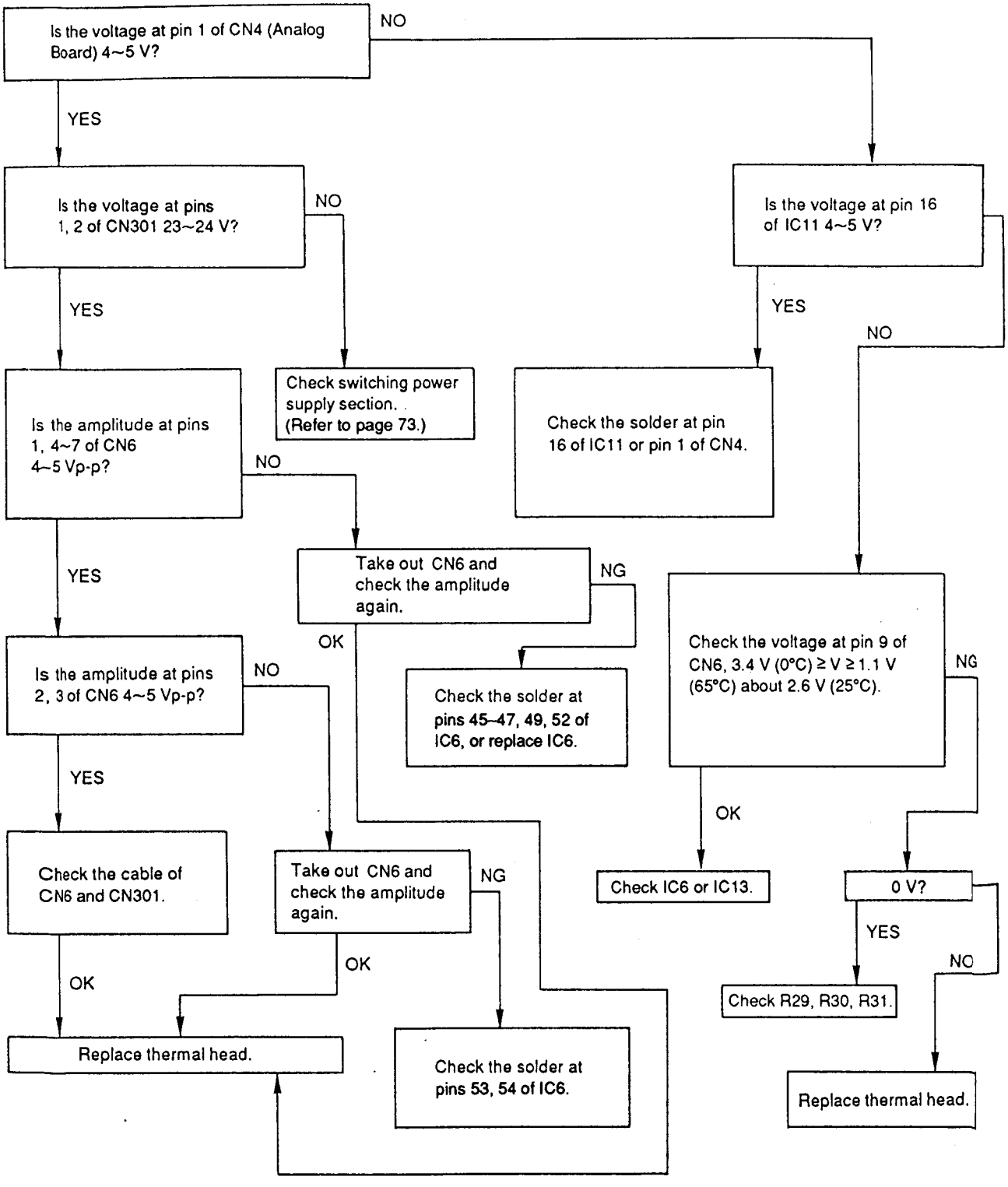
Waveform: ① CH1: CCD signal
② CH2 FTG: GATE signal (trigger)

Note: This waveform will be shown when the CCD reads the white plate of document cover.

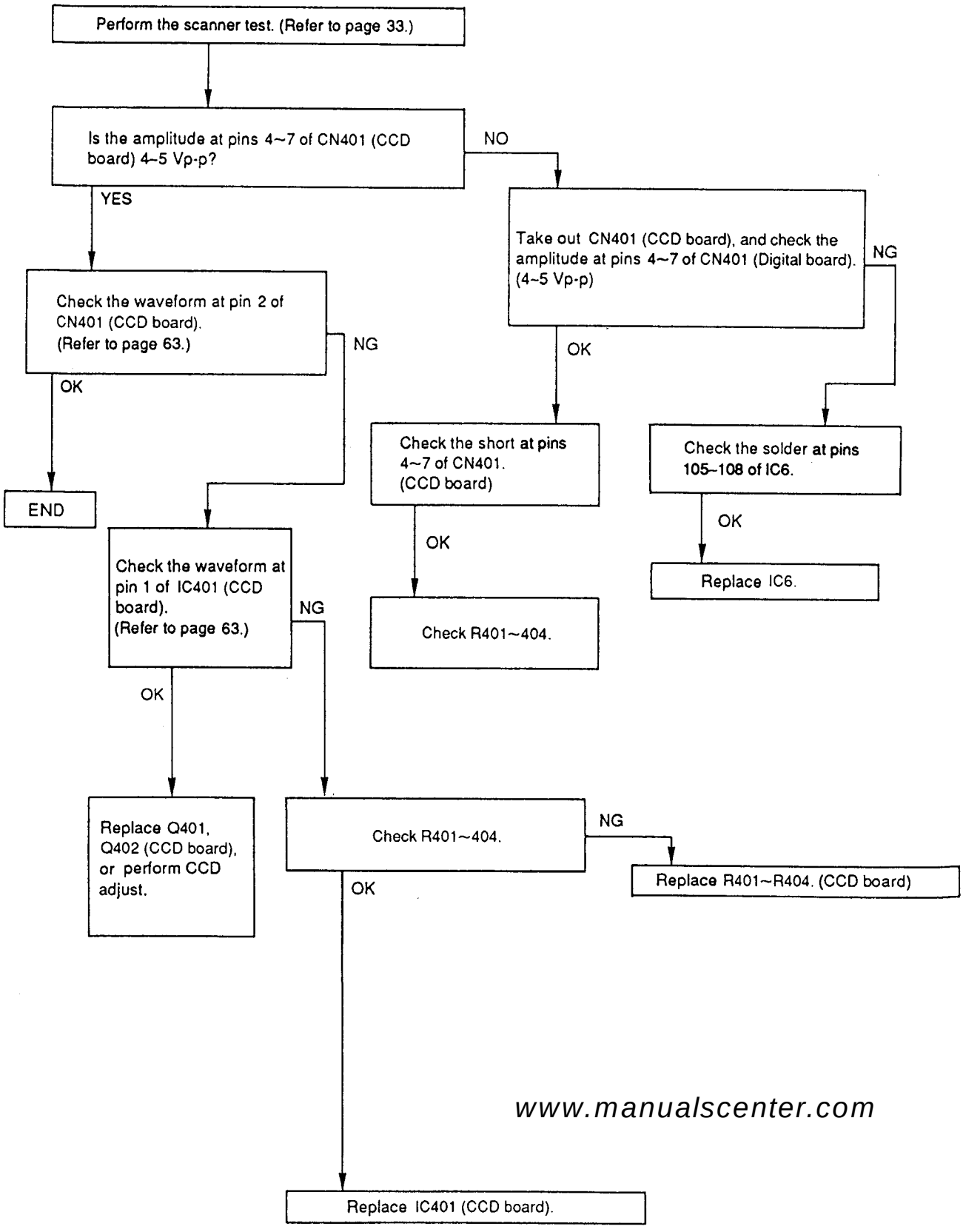


No.	CH1 probe point
③-1	IC401 pin 1 (CCD Board)
③-2	CN401 pin 7 (CCD Board)
④	IC12 pin 14

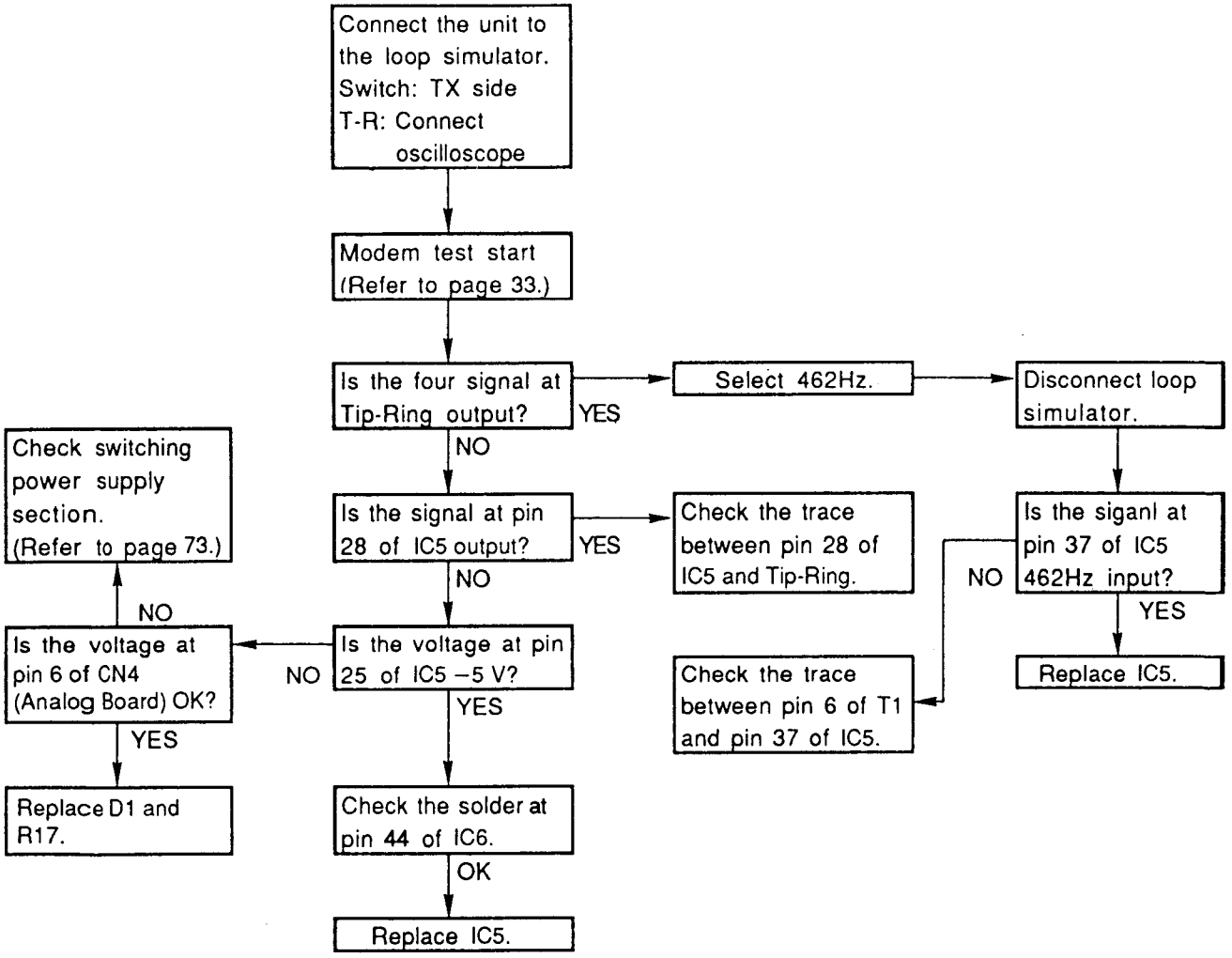
Note 6) Check the thermal head



Note 7) Check CCD board



6-4. UNIT CAN COPY, BUT CAN NOT TRANSMIT/RECEIVE



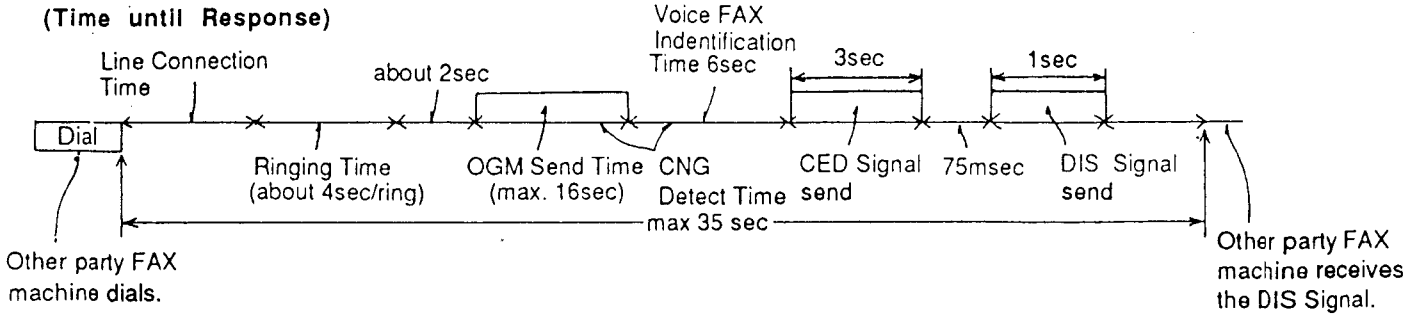
6-5. UNIT CAN COPY, BUT CAN NOT TRANSMIT/RECEIVE LONG DISTANCE OR INTERNATIONAL COMMUNICATION

The following 2 causes can be considered for this.

1) Cause 1

The other party is executing automatic calling, the call has been received by this unit, and the time until response with a CED or DIS signal has been too long. (In almost case, this unit detects CNG signal and can respond to CED or DIS.) (According to the CCITT standard, the communication procedure is stopped when there is no response from the other party within 35sec, so that the other party releases the line.)

(Time until Response)



(Cause and Countermeasure)

As shown in the above chart, the total handshaking time must be reduced, but because of the long distance connection and linking of several stations, the line connection time can not be reduced. Accordingly, the following countermeasures should be tried.

(A) The automatic reception bell number should be1. (user parameter: code No. 05)

(B) The OGM recording time should be made as short as possible. (if possible, 8sec or less)

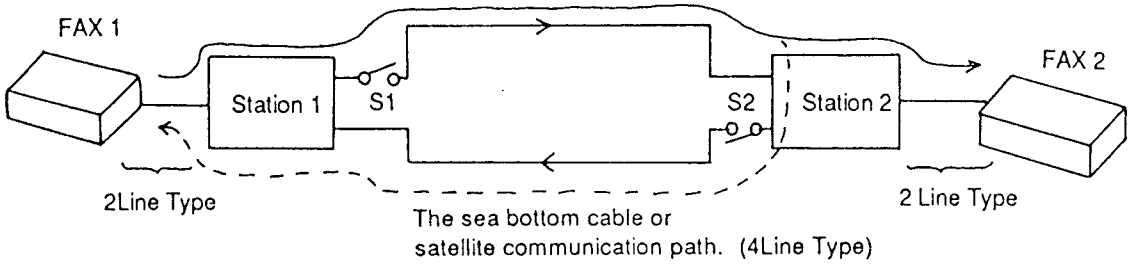
(C) As the count of 35 sec is started directly after dialing or directly after the START button has been pressed for models with a START button, the other party should be called manually, if possible, this unit should be switched to FAX by [*] button whne the OGM is heard, and then the START button should be pressed for FAX communication.
Another possibility is entry of two pauses at the end of the auto dial number of the transmission side, In this way, the start time for the count can be delayed by 2 pauses (about 10sec).

(Note) For short OGM recording, the OGM button must be pressed to end the OGM recording.

2) Cause 2

Erroneous detection because of echo or erroneous detection because of an echo canceler.

(Echo/Echo Canceler)



The signal from FAX1 reaches FAX2 via the stations 1 and 2, but the reflection signal at station 2 also returns via station 1 (echo). As the distance between station 1 and station 2 is long, the echo returns to FAX 1 max. 600msec after transmission, so that there is the possibility that this signal is detected erroneously as the signal from FAX2 and that trouble is caused. In the case of a normal call, there is also the possibility that the echo of the own voice will make the call difficult to understand. For this reason, each station (station 1, station 2) attaches echo cancelers (S1, S2) in case of international lines or long distance lines. For the echo canceler, the level of the transmission signal from FAX 1 is compared with the level of the reception signal from the FAX2, and when transmission signal is larger, S1 is closed, while S2 is opened when it is smaller. In other words, with transmission from FAX1, S1 is closed and S2 is open, so that the echo does not return to FAX1.

(Cause and Countermeasure)

(Cause A)

When the training signal is transmitted from FAX1 during the communication procedure at the time of transmission from FAX1 to FAX2, there is a delay until the echo canceler operates and S1 is closed, so that a part of the head of the training signal may drop out, normal reception by FAX2 may not be possible,and transmission may not be started.

(Countermeasure A)

When the international line mode becomes ON in service mode (code No. 521), a dummy signal is attached to the head of the training signal to prevent this problem. As this normally is ON, it is necessary to reconfirm that this has not becomes OFF. When the international mode is switched OFF, the transmission side will try the training signal three times at each speed (9600BPS, 4800BPS and 2400BPS), and in case of NG, it will drop the speed by one rank (fall-back). When the international mode is switched ON, each speed will be tried only twice. In other words, the slower speed with fewer errors are reached more easily. This is done as the line conditions may deteriorate and the picture may be disturbed more easily during communication in case of international lines or long distance communication, even when the training has been OK.The default value is ON as preference is given to clearer pictures rather than speed.

(Cause B)

The echo canceler operation is stopped with a signal of 2100Hz (i.e. S1 and S2 become ON).
Accordingly, when FAX1 has executed automatic reception, a CED signal is output, and if this signal should be 2100Hz, S1 and S2 will become ON. Then the echo of the DIS signal output afterwards may be received and FAX1 may execute erroneous operation, preventing start of communication.

(Countermeasure B)

In service mode, the CED signal frequency is set to 1100 Hz (code No. 520) or the time setting between the CED signal and the DIS signal is set from 75msec to 500msec in service mode (code No. 593). This is done because the echo canceler operation stop mode is cancelled with an interval of 250msec or more.

(Cause C)

KX-F230 shall be assumed for FAX1 and a set of a different company shall be assumed for FAX2.
In case of transmission from the KX-F230 to FAX2, FAX2 executes automatic reception and transmits a CED signal (2100 Hz), followed by a DIS signal. As here the echo cancelers stops as described in cause B, the echo of the DIS signal returns to FAX2. On the other hand, the KX-F230 detects the DIS signal and transmits a DCS signal. In other words, it is possible that the echo of the DIS signal and the DCS signal transmitted from the KX-F230 reach FAX2 one after the other, FAX2 executes erroneous detection, and communication are not started.

(Countermeasure C)

When international DIS detection setting is made effective in service mode (code No. 594), the KX-F230 does not respond to the first DIS signal and returns a DCS signal only for the second DIS signal.
In other words, there is an interval of 250msec between transmission of the first and the second DIS signal, so that the echo cancelers operation recovers and no echo is generated for the second DIS signal.

Note:

When the other FAX does not respond with a DCS signal after DIS signal transmission, the DIS signal is transmitted three times for trial.

3) **Summary**
Long distance and international communication operation

SYMPTOM	COUNTERMEASURE
Does not receive in automatic mode.	1. The automatic reception ring count should be 1. (user parameter: code No. 05) 2. The OGM recording time should be made as short as possible. (if possible, 8sec or less) 3. If possible, manual transmission should be made from the transmission side. 4. If possible, two pauses should be inserted at the end of the auto dial number of the transmission side. 5. If possible, the Function Selector Switch should be switched from ANS/FAX to TEL/FAX or FAX.
Does not transmit.	1. Confirm the international line mode ON. (service mode: code No. 521) 2. International DIS detection setting is made effective. (service mode: code No. 594)
Does not receive.	1. The time setting between the CED signal and the DIS signal is set to 500msec. (service mode: code No. 593) 2. The CED frequency is set to 1100Hz. (service mode: code No. 520)

6-6. UNIT CAN COPY, BUT THE TRANSMISSION AND RECEPTION IMAGE IS INCORRECT (LONG DISTANCE OR INTERNATIONAL COMMUNICATION OPERATION)

This depends widely on the transmission and reception capability of the other FAX set and the line conditions.
The countermeasures for this set are shown below.

1) Transmission Operation

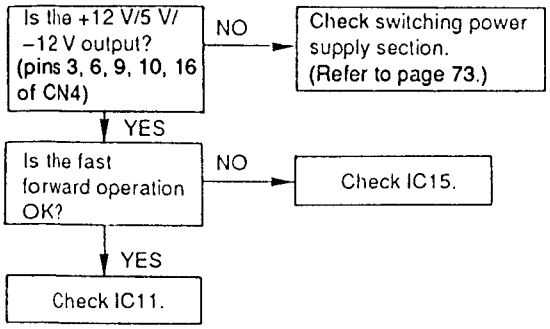
(1) The transmitting speed is set to 4800BPS. (service mode: code No. 717)
(Individual correspondence according to the other set is desirable.)
(2) The transmitting equalizer is set to 3.6km. (service mode: code No. 524)
(Individual correspondence according to the other set is desirable.)

2) Reception Operation

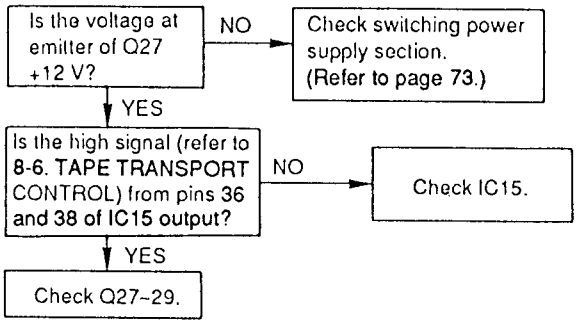
(1) If 80% or more of the reception should be incorrect, set the receiving speed to 4800BPS. (service mode: code No. 718)
(2) If 80% or more of the reception should be incorrect, set the receiving equalizer to 3.6km. (service mode: code No. 523)

7. DEFECTIVE ATAS (Automatic Telephone Answering System) SECTION

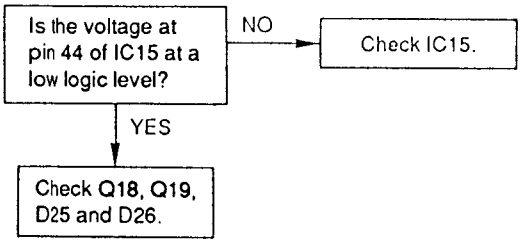
7-1. NO ATAS OPERATION



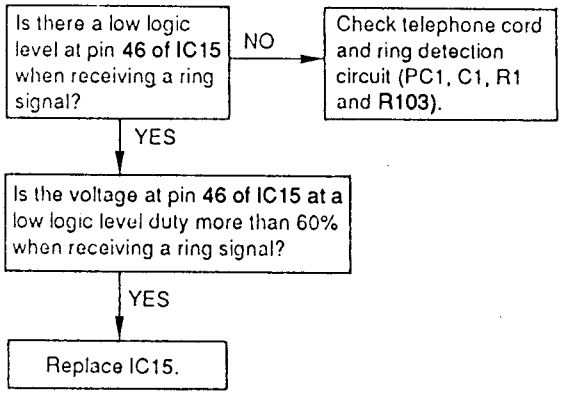
7-2. DOES NOT PULL THE PLUNGER



7-3. NO QUICK ERASE



7-4. NO AUTOMATIC RECEPTION



7-5. ICM CONTINUES TO RECORD AFTER THE CALLER ON-HOOK

When the caller on-hook, this unit can detect the following 4 signal types.
A. CPC pulse
B. Dial tone or other continuous tones
C. Silence
D. Cyclic signals

A. Check CPC DETECTION CIRCUIT. (Refer to page 143.)
B., C., D.
Check VOX DETECTION CIRCUIT. (Refer to page 150.)

7-6. REMOTE CONTROL DOES NOT WORK/RESPONSE IS POOR

The following are considered as the cause of no remote reception:
A. Is the ID code the same as set on the unit?
B. The send signal interferes with the remote signal, causing the remote signal at the line output from circuit to be distorted.
C. Excessive loss in telephone line.

A. Check the ID code of the unit.
B. Check NCU section. (Refer to page 142.)
C. Test on known telephone line to be working properly.

•If all of the above check are N.G., check the remote signal detection circuit. (Refer to page 155.)

7-7. NO OGM RECORD/PLAYBACK

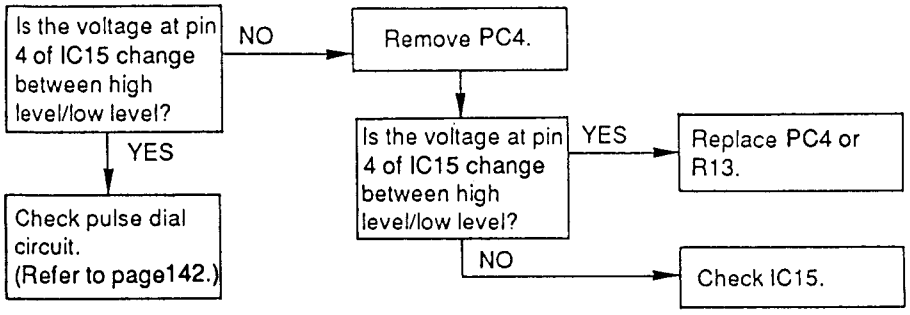
Check IC7. (Refer to page 153.)

8. DEFECTIVE ITS (Integrated Telephone System) SECTION

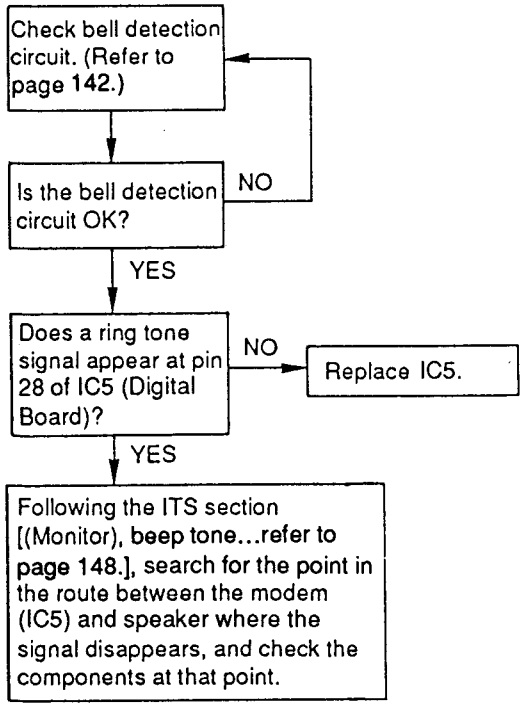
8-1. NO HANDSET and SPEAKERPHONE TRANSMISSION/RECEPTION

Following the ITS section (Refer to page 147.) or NCU section (Refer to page 142.), search for the point in the route between the handset microphone and the telephone line (sending) or between the telephone line and the handset speaker (receiving) or between the microphone and the telephone line (sending) or between the telephone line and the speaker (receiving) where the signal disappears, and check the components at that point.

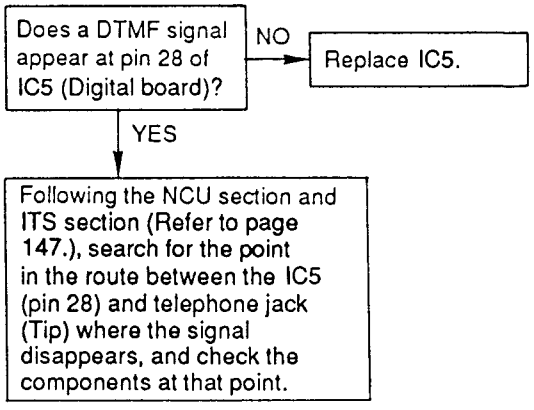
8-2. NO PULSE DIAL



8-3. NO RING TONE

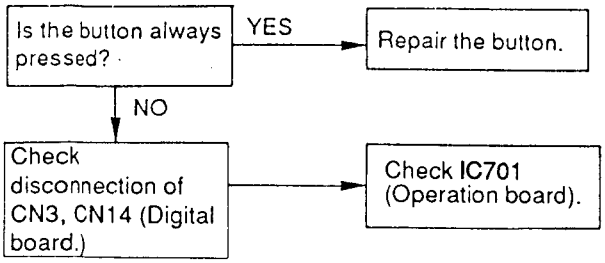


8-4. NO TONE DIALING

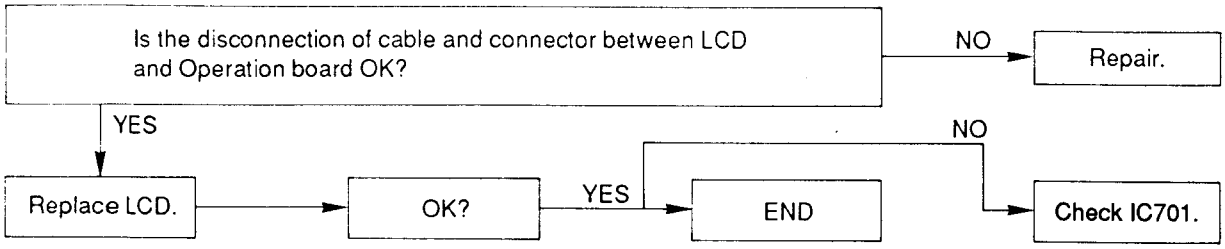


9. DEFECTIVE OPERATION GRILLE SECTION

9-1. NO KEY OPERATION

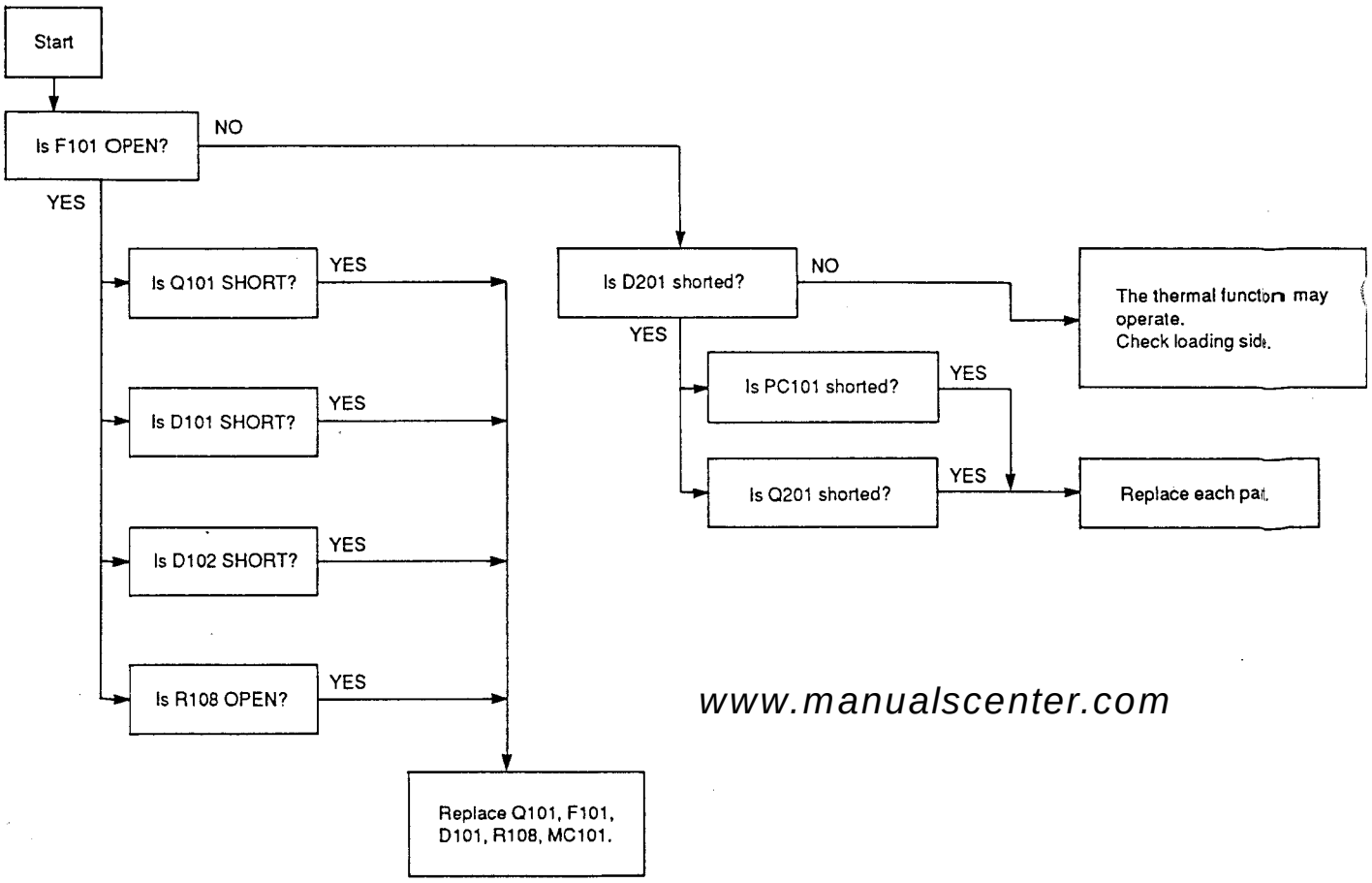


9-2. NO LCD INDICATION

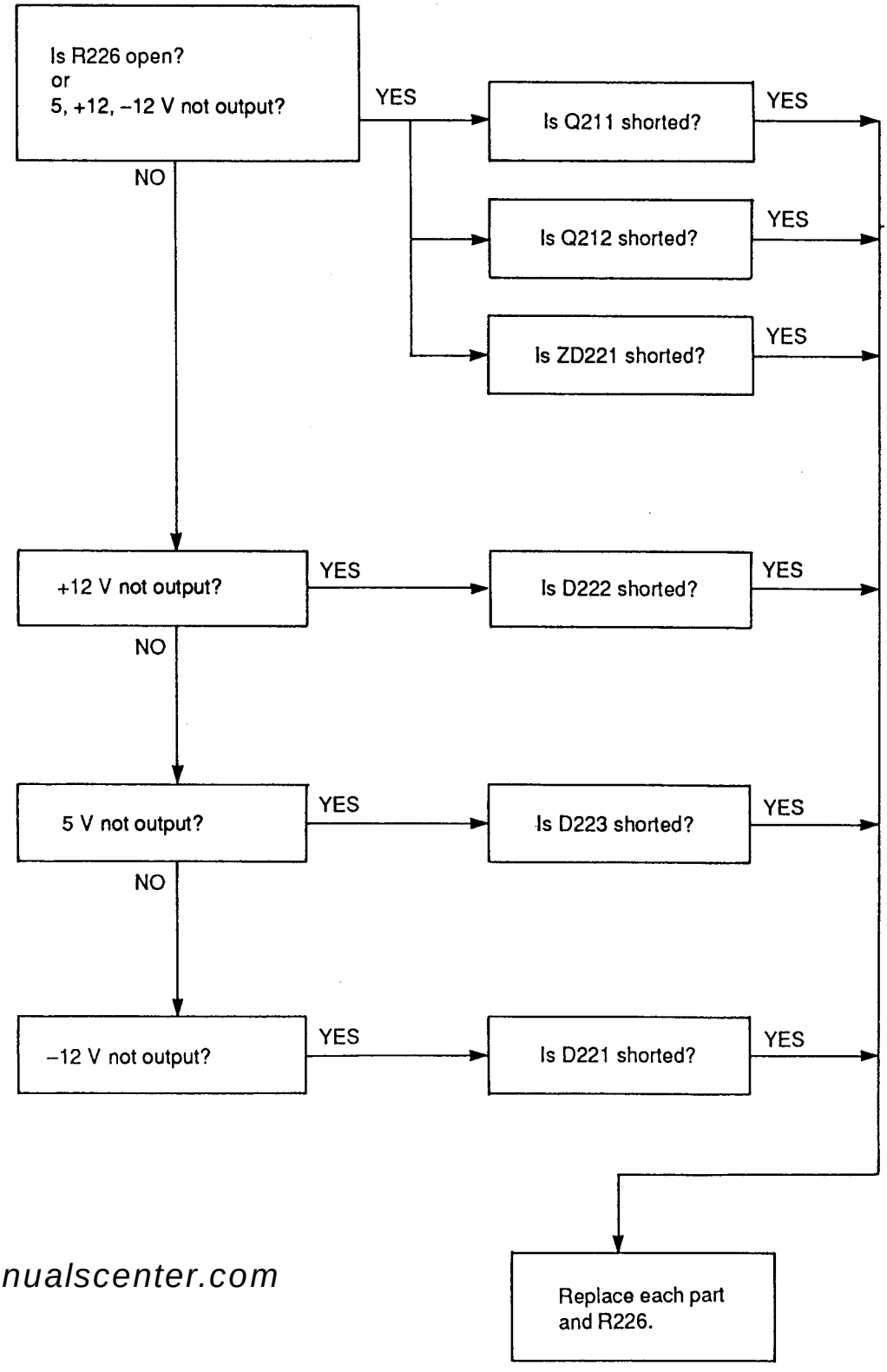


10. DEFECTIVE SWITCHING POWER SUPPLY SECTION

10-1. NO OPERATION

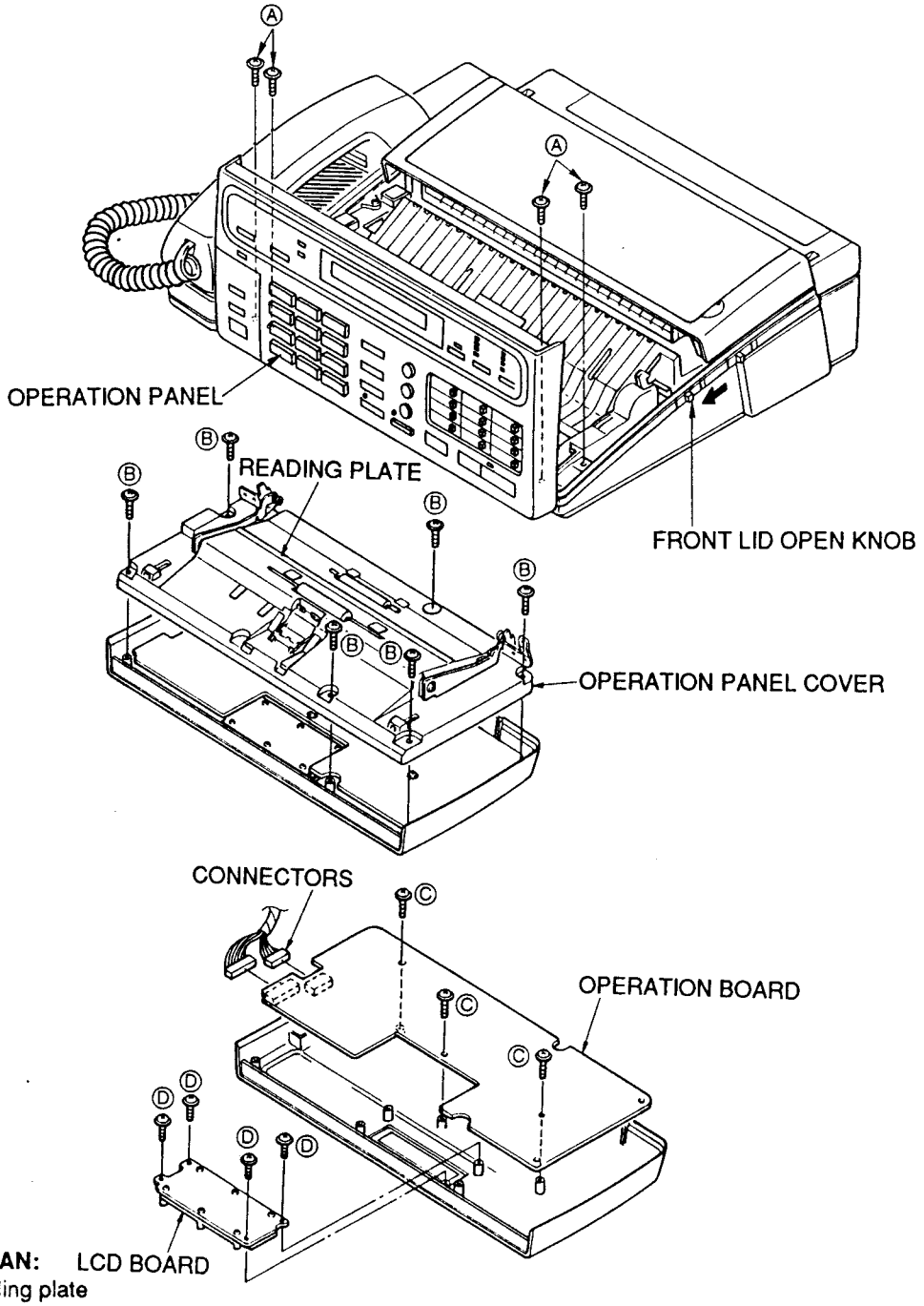


10-2. THE CORRECT VOLTAGE IS OUTPUT FROM THE 24 V SYSTEM BUT 5 V, 12 V AND −12 V ARE NOT OUTPUT



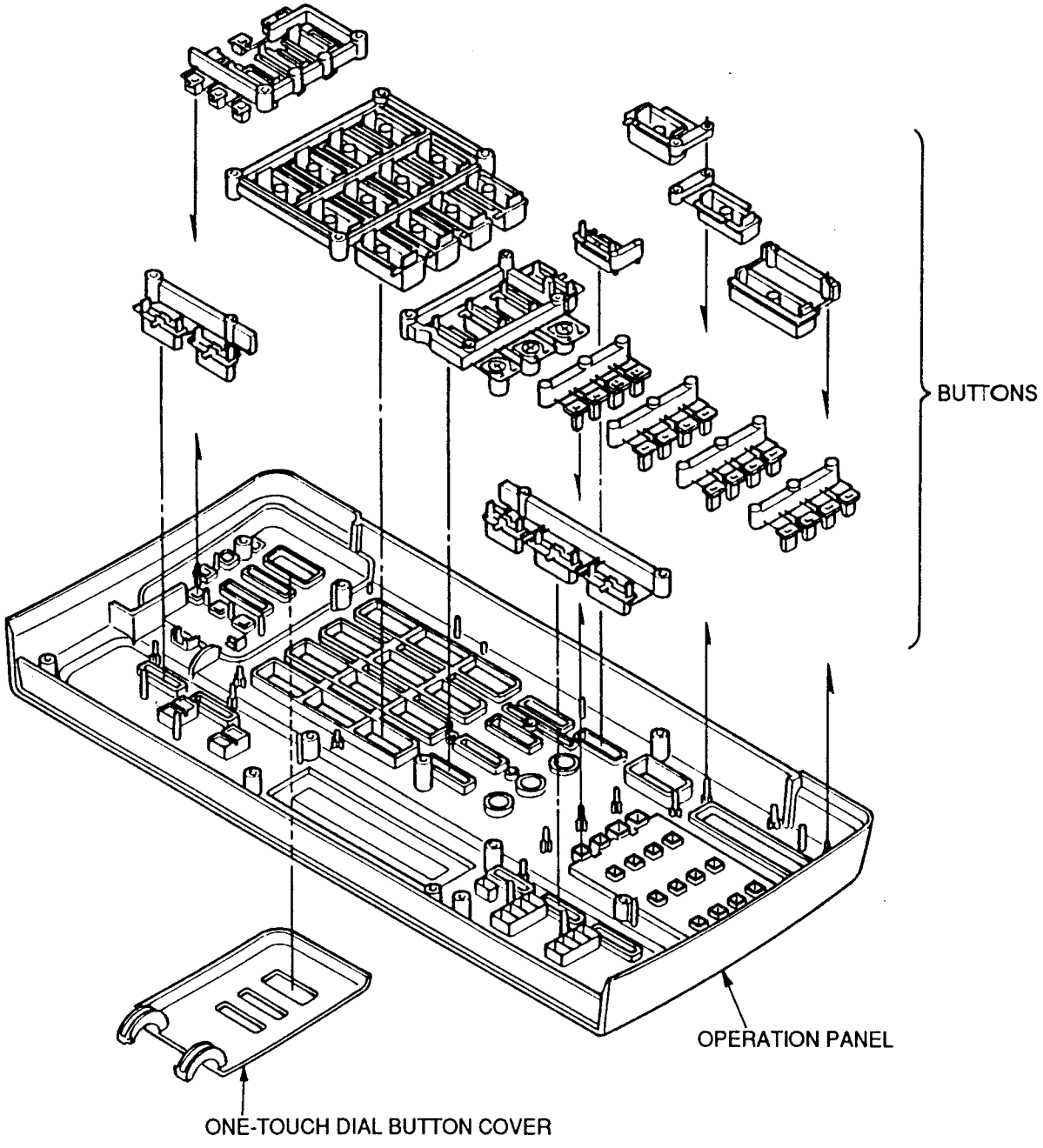
DISASSEMBLY INSTRUCTIONS

Ref. No. 1	HOW TO REMOVE THE OPERATION AND LCD BOARDS
Procedure 1	1) Push the front lid open knob in direction of arrow to open the operation panel. 2) Remove the 4 screws (Ⓐ) and remove the operation panel. 3) Remove the 6 screws (Ⓑ) and remove the operation panel cover. 4) Remove the 3 screws (Ⓒ). 5) Remove the 2 connectors and remove the operation board. 6) Remove the 4 screws (Ⓓ) and remove LCD board.

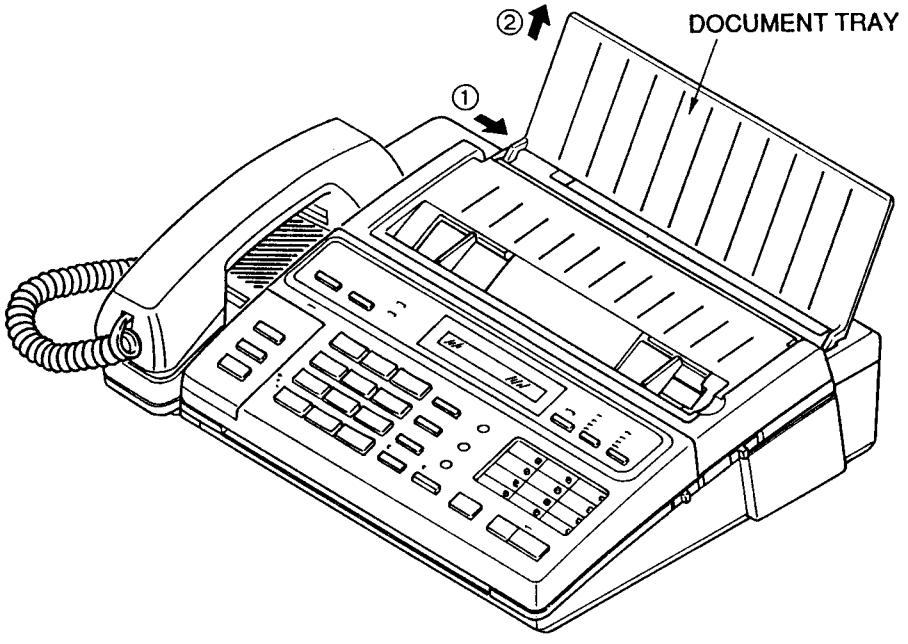


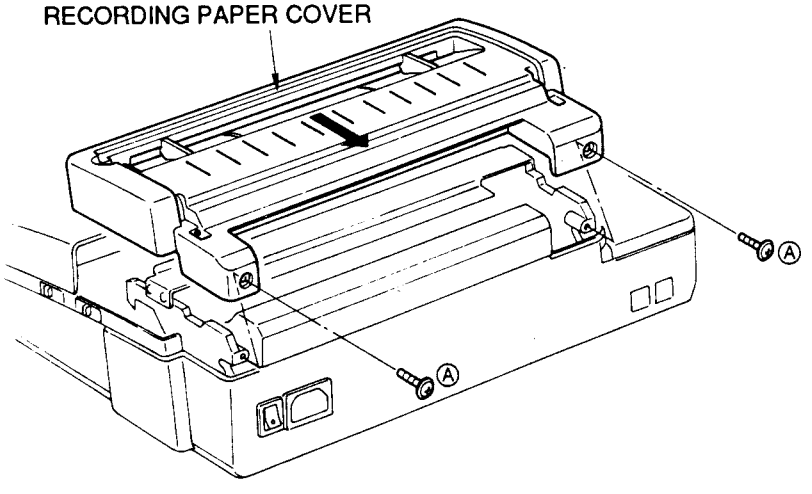
HOW TO CLEAN:
Clean the reading plate with cloth soaking in alcohol.

Ref. No. 2	HOW TO REMOVE THE BUTTONS AND OPERATION PANEL
Procedure 1→2	1) Remove each button from the operation panel and replace it. 2) Remove the one-touch dial button cover. 3) Replace the operation panel.



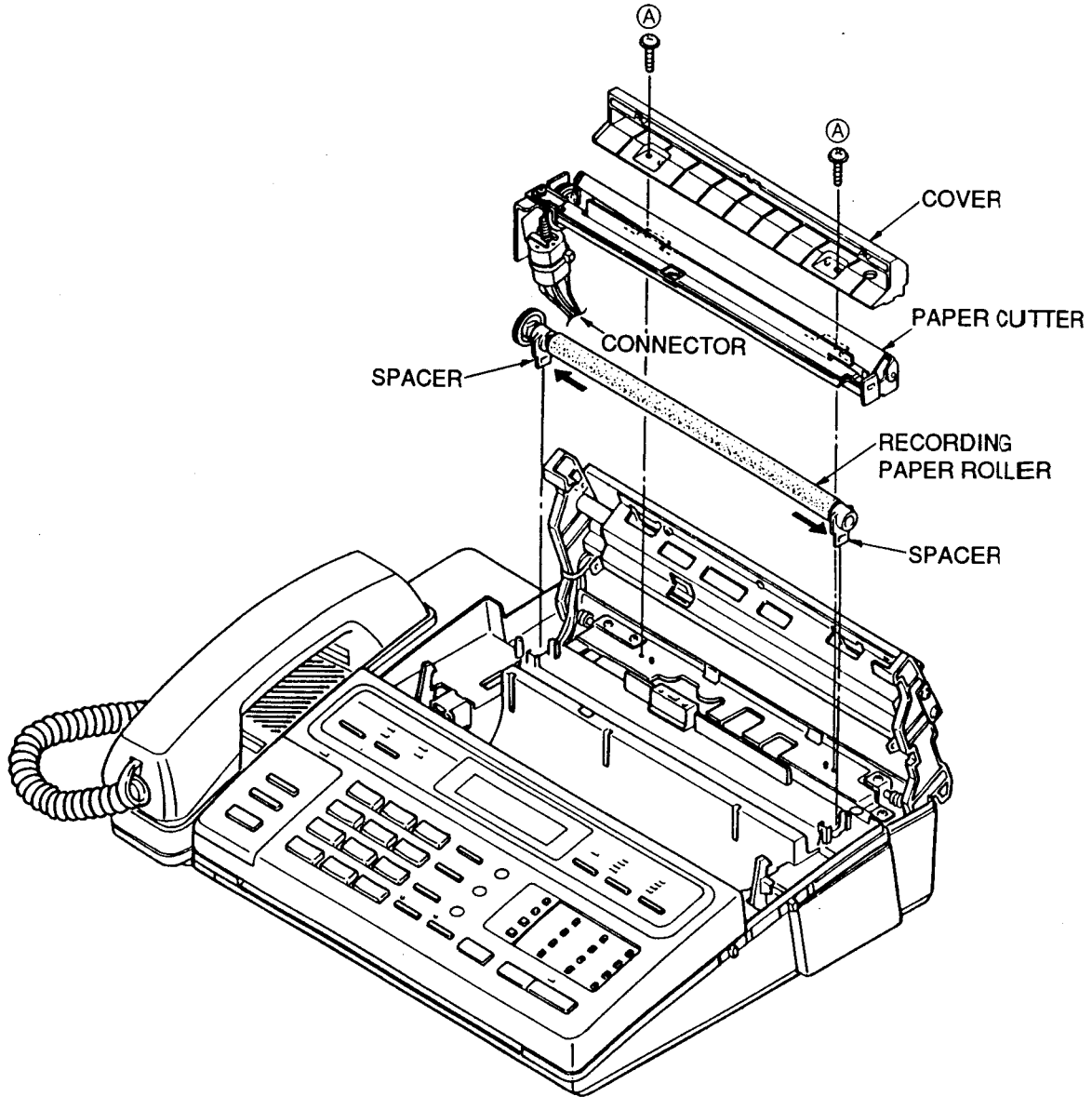
Ref. No. 3	HOW TO REMOVE THE DOCUMENT TRAY AND RECORDING PAPER COVER
Procedure 3	1) Push the installing section in direction of arrow to remove the document tray. 2) Remove the 2 screws (Ⓐ). 3) Push the cover in direction of arrow to remove the recording paper cover.





Ref. No. 4	HOW TO REMOVE THE PAPER CUTTER AND RECORDING PAPER ROLLER
Procedure 3→6→7→ 8→4	

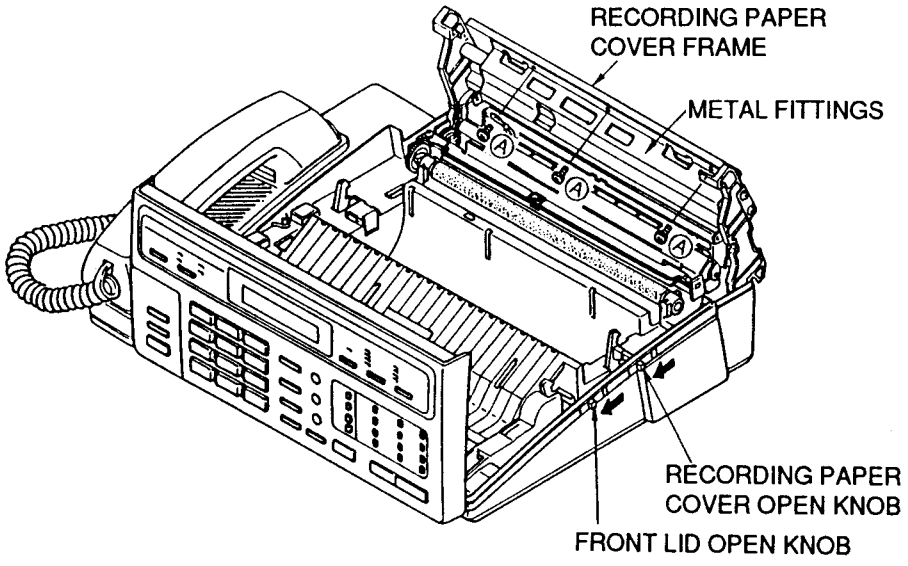
1) Remove the 2 screws (Ⓐ) and remove the cover.
2) Remove the paper cutter.
3) Remove the connector for paper cutter. (See Ref. No. 7.)
4) Remove the spacer of the recording paper roller by pressing it in the direction of the arrow from inside the unit.

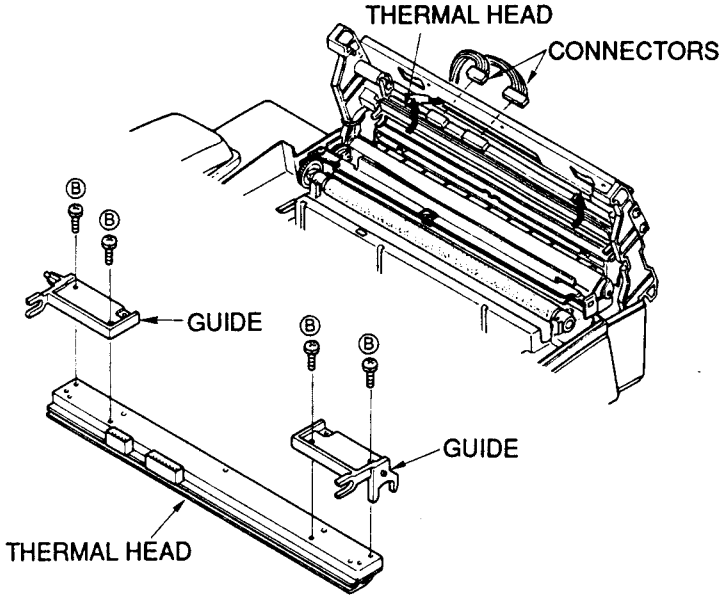


HOW TO CLEAN:
Clean the rollers with cloth soaking in alcohol.

Ref. No. 5	HOW TO REMOVE THE THERMAL HEAD
Procedure 3→5	

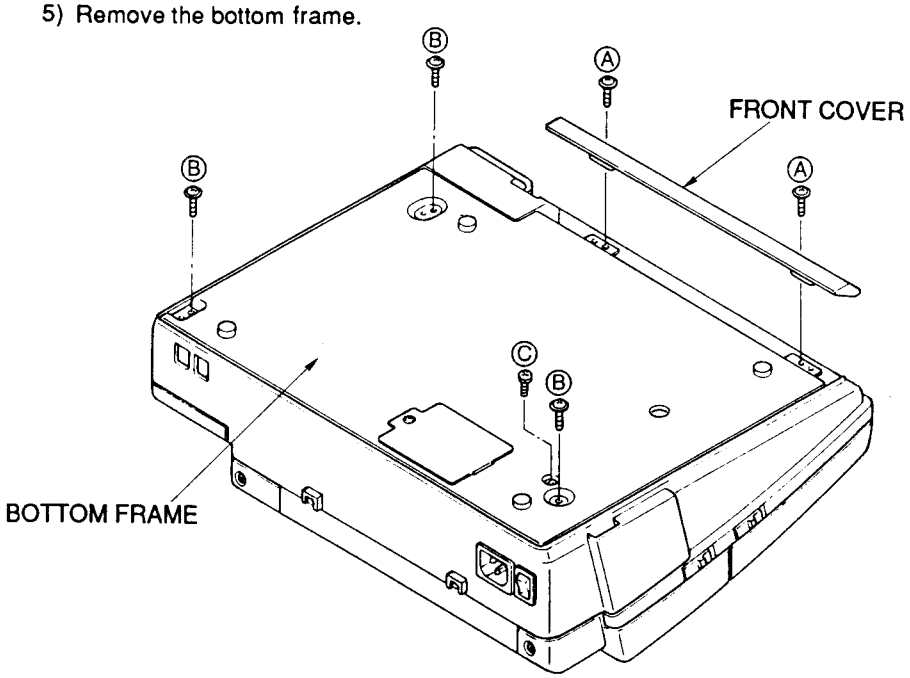
1) Push the front lid open knob in direction of arrow to open the operation panel.
2) Push the recording paper cover open knob in direction of arrow to open the recording paper cover frame.
3) Remove the 3 screws (Ⓐ) and remove the metal fittings.
4) Push the thermal head in direction of arrow to remove the thermal head.
5) Remove the 2 connectors of thermal head.
6) Remove the 4 screws (Ⓑ) of thermal head to remove the guides.
7) Replace the thermal head.



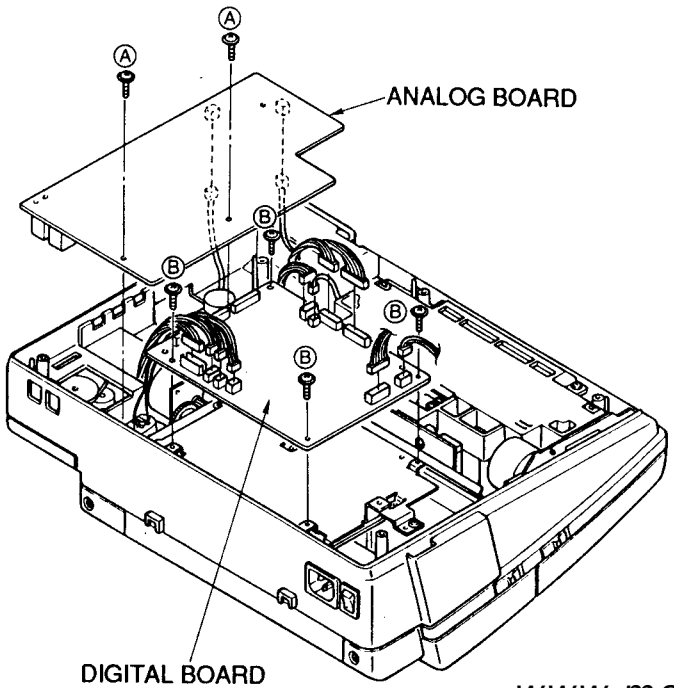


HOW TO CLEAN:
Clean the printing surface of thermal head with cloth soaking in alcohol.

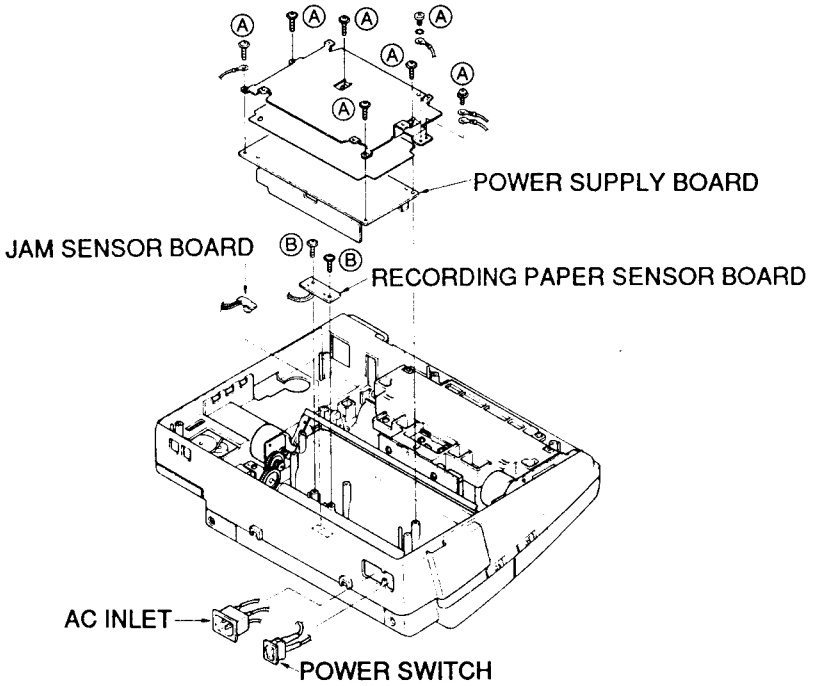
Ref. No. 6	HOW TO REMOVE THE BOTTOM FRAME
Procedure 6	1) Remove the 2 screws (Ⓐ). 2) Remove the front cover. 3) Remove the 3 screws (Ⓑ). 4) Remove the screw (Ⓒ). 5) Remove the bottom frame.



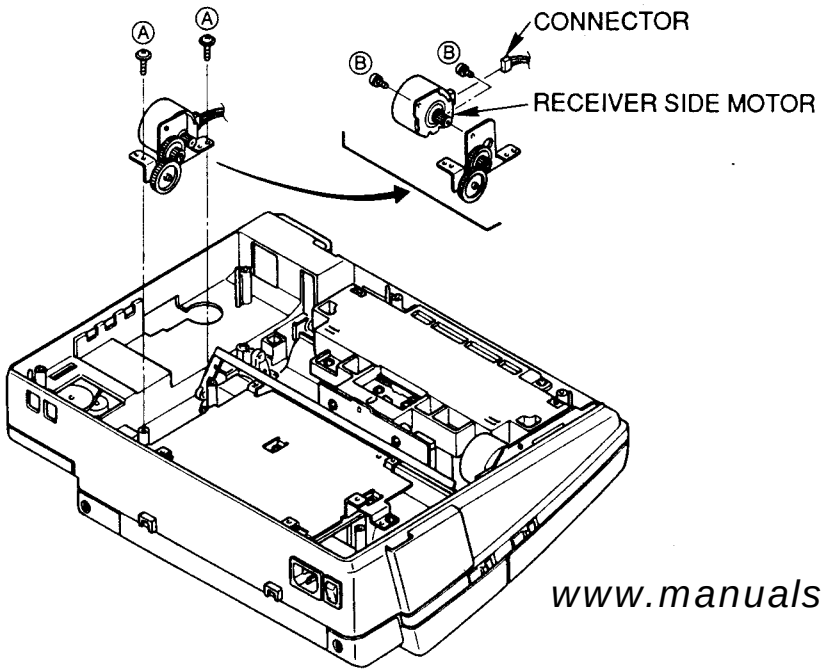
Ref. No. 7	HOW TO REMOVE THE ANALOG AND DIGITAL BOARDS
Procedure 6→7	1) Remove the 2 screws (Ⓐ). 2) Remove the analog board. 3) Remove the 2 connectors. 4) Remove the 4 screws (Ⓑ). 5) Remove the digital board. 6) Remove the 10 connectors.



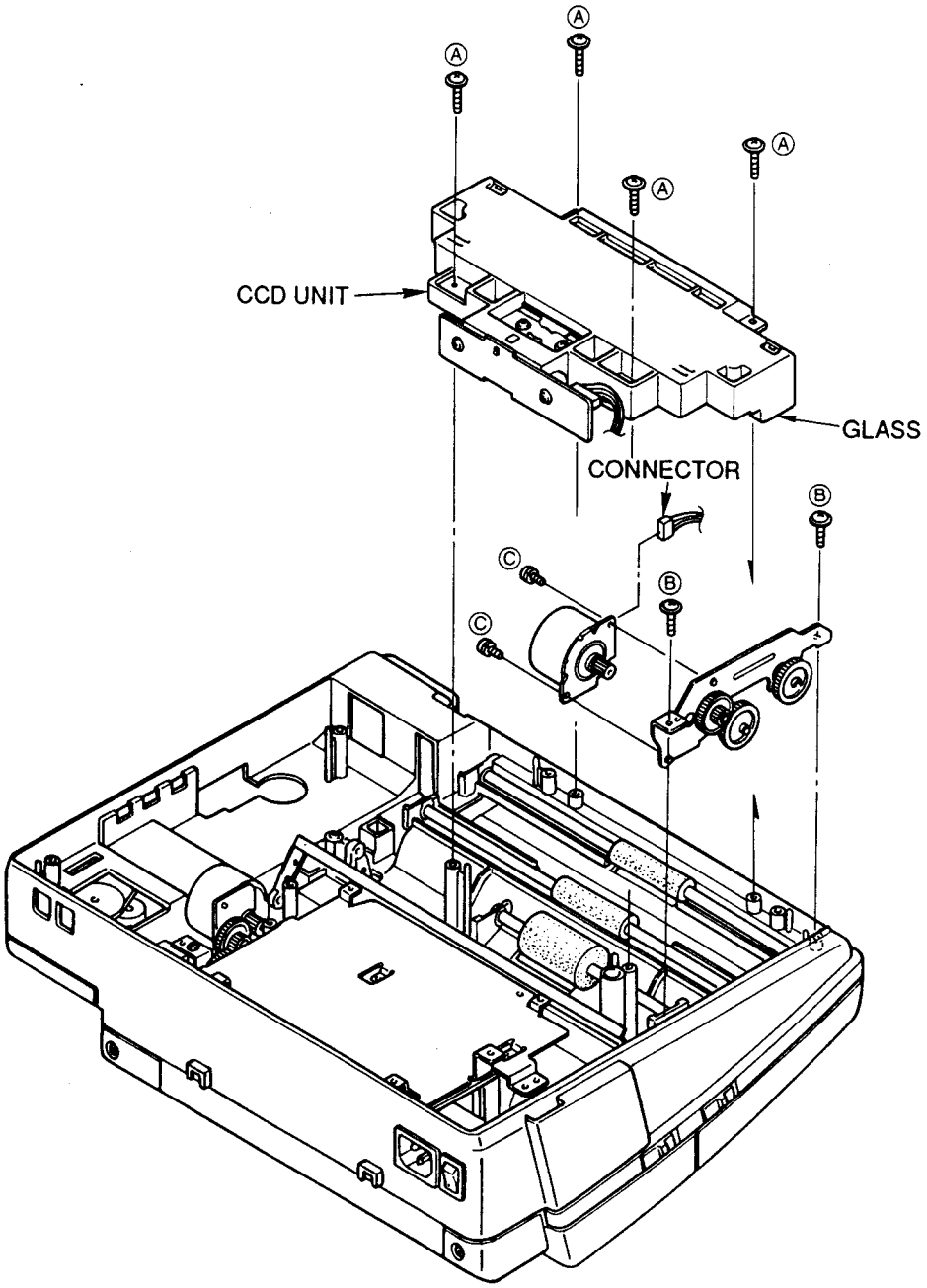
Ref. No. 8	**HOW TO REMOVE THE POWER SUPPLY BOARD, RECORDING PAPER SENSOR BOARD, JAM SENSOR BOARD, AC INLET AND POWER SWITCH**
Procedure 6→7→8	1) Remove the 7 screws (Ⓐ) and remove the power supply board. 2) Remove the 2 screws (Ⓑ) and recording paper sensor board. 3) Remove the JAM sensor board. 4) Remove the AC inlet and power switch.



Ref. No. 9	**HOW TO REMOVE THE RECEIVER SIDE MOTOR**
Procedure 6→7→9	1) Remove the 2 screws (Ⓐ). 2) Remove the motor section. 3) Remove the 2 screws (Ⓑ). 4) Remove the connector. 5) Remove the receiver side motor.



Ref. No. 10	HOW TO REMOVE THE CCD UNIT AND TRANSMITTING SIDE MOTOR
Procedure 6→7→10	1) Remove the 4 screws (Ⓐ). 2) Remove the CCD unit. 3) Remove the 2 screws (Ⓑ) and remove the transmitting motor section. 4) Remove the connector. 5) Remove the 2 screws (Ⓒ) and replace the motor.



HOW TO CLEAN:
Clean the glass of CCD unit with cloth soaking in alcohol.

Ref. No. 11	**HOW TO REMOVE THE ROLLER**
Procedure 6→7→10→11	1) Remove the spacer with minus screwdriver (small size) as showing in following Fig. A. 2) Remove the roller. 3) Remove the gear and spacer from roller shaft and replace roller.

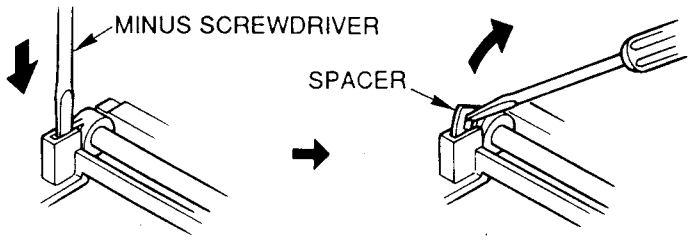
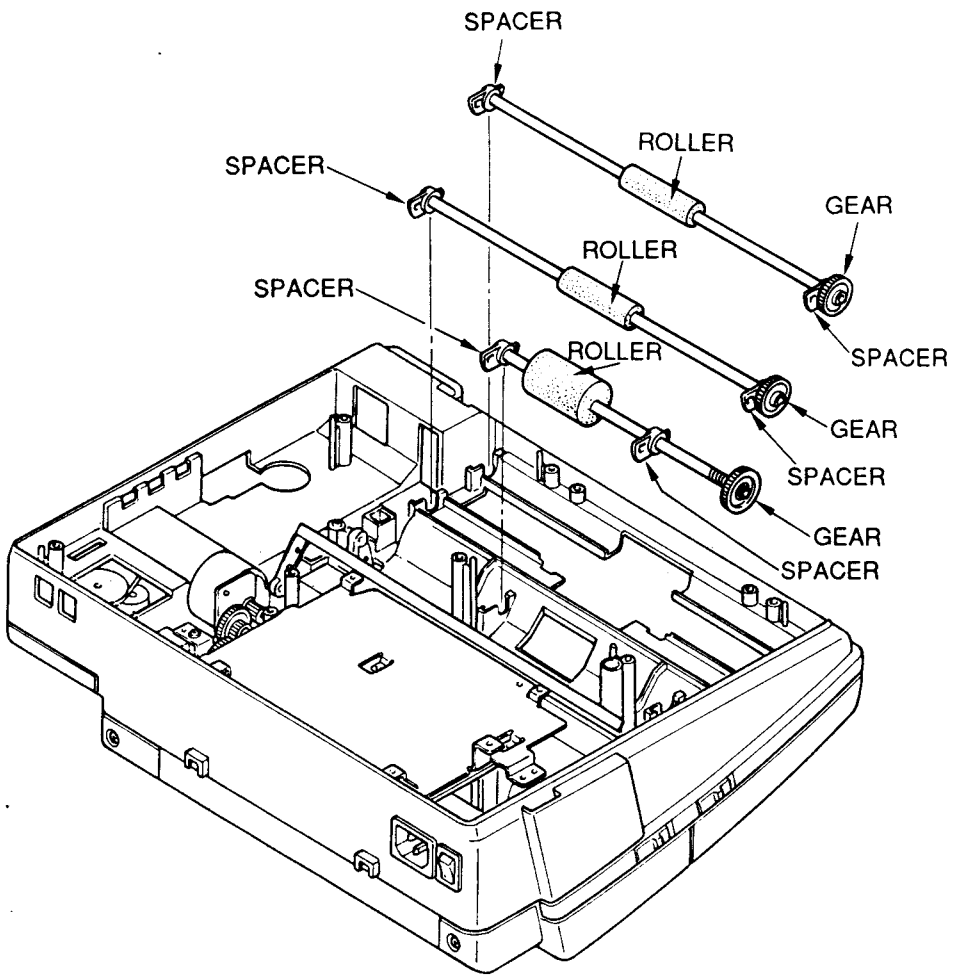
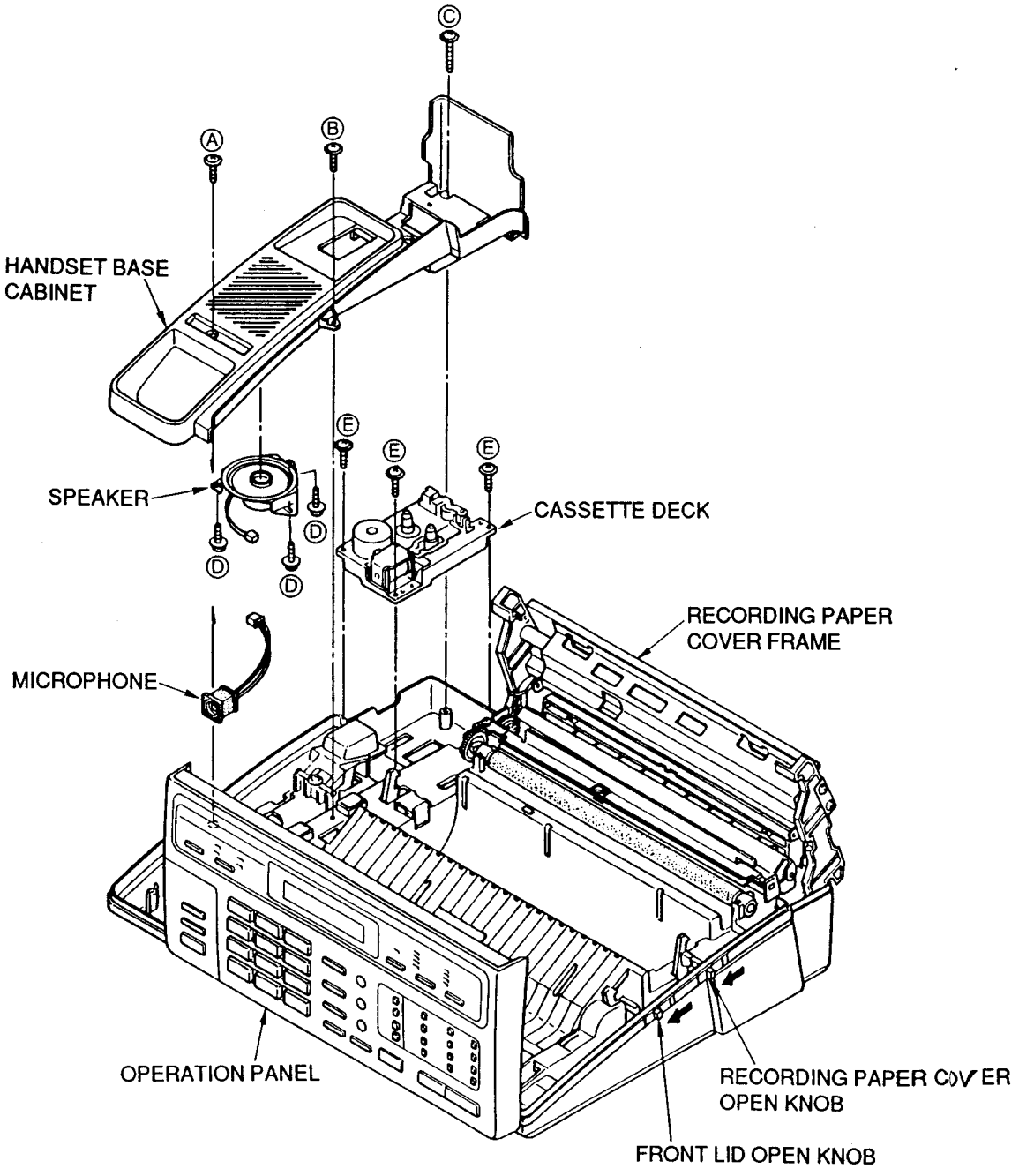


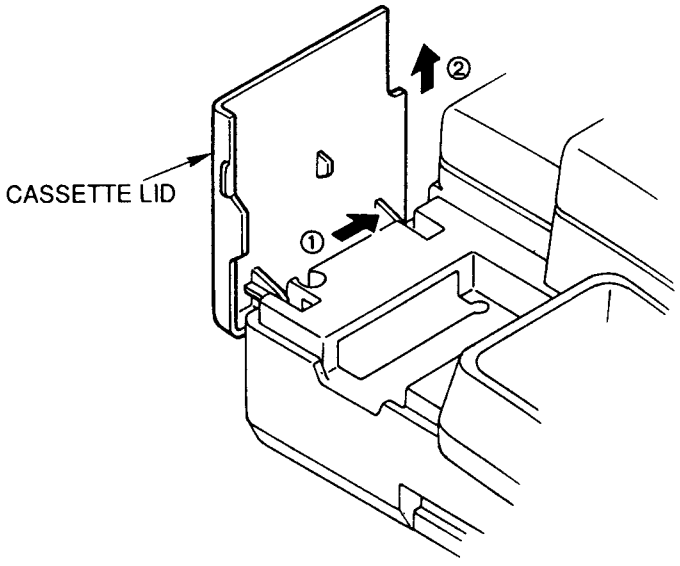
Fig. A



Ref. No.12	HOW TO REMOVE THE HANDSET BASE CAB., SPEAKER, MICROPHONE AND CASSETTE DECK
Procedure 3→6→7→12	1) Push the recording paper cover open knob to open the recording paper cover frame. 2) Push the front lid open knob to open the operation panel. 3) Remove the each 1 screw (Ⓐ, Ⓑ, Ⓒ). 4) Remove the handset base cabinet. 5) Remove the 3 screws (Ⓓ) and remove the speaker. 6) Remove the 3 screws (Ⓔ). 7) Remove the cassette deck.



Ref. No. 13	**HOW TO REMOVE THE CASSETTE LID**
Procedure 13	1) When removing the cassette lid, push in direction of arrow.



HOW TO REPLACE FLAT PACKAGE IC

■ PREPARATION

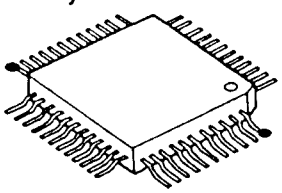
- SOLDER ..... Sparkle Solder 115A-1, 115B-1
  OR
  Almit Solder KR-19, KR-19RMA
- Soldering iron ..... Recomended power consumption will be between 30 W to 40 W.
  Temperature of Copper Rod 662 ±50° F (350 ±10° C)

  (An expert may handle 60–80 W iron, but beginner might damage foil by overheating.)
- Flux ..... HI115 Specific gravity 0.863

  (Original flux will be replaced daily.)

■ PROCEDURE

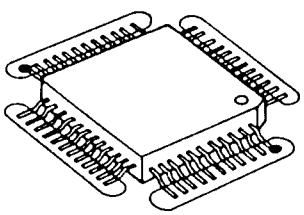
1. Temporarily fix FLAT PACKAGE IC by Soldering on two marked pins.

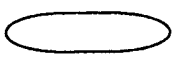


●.....Temporary soldering point.

*Most important matter is accurate setting of IC to the corresponding soldering foil.

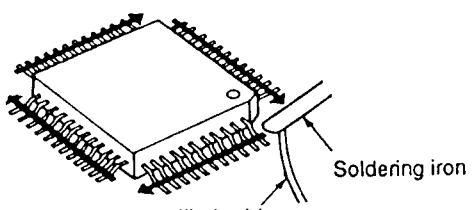
2. Apply flux for all pins of FLAT PACKAGE IC.





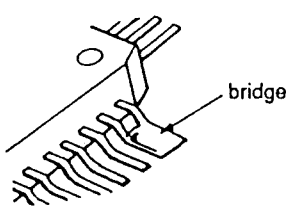
.....Flux

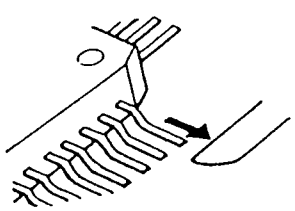
3. Solder employing specified solder to direction arrow, as slide the soldering iron.



■ MODIFICATION PROCEDURE OF BRIDGE

1. Re-solder slightly on bridged portion.
2. Remove remaining solder along pins employing soldering iron as shown in below Figure.



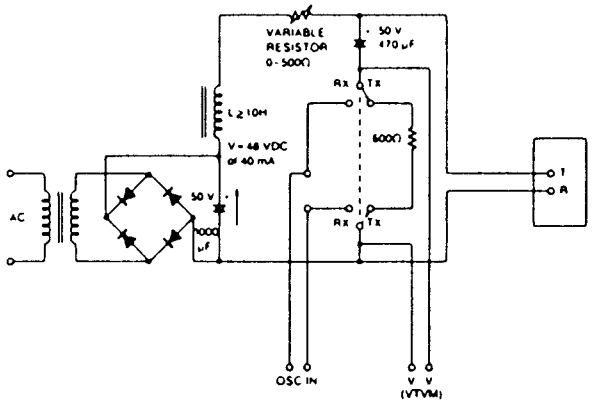


ADJUSTMENTS

1. TABLE OF TEST EQUIPMENTS AND JIG

No.	Test Equipment and Jig Name	Jig No.	Adjustment Name
1	VTVM	———	Cassette Deck
2	Loop Simulator	———	FAX Transmission Level
3	Test Tape	QZZMWA or PQZZLCT 2401A	Cassette Deck
4	Oscilloscope	———	Cassette Deck CCD
5	Frequency Counter	———	Cassette Deck
6	CCD Jig	PQZZF150M	CCD
7	Extension Cord	Refer to pages 194 and 212.	CCD etc.
8	Locating Tool	PQZZ2060Z	Cassette Deck

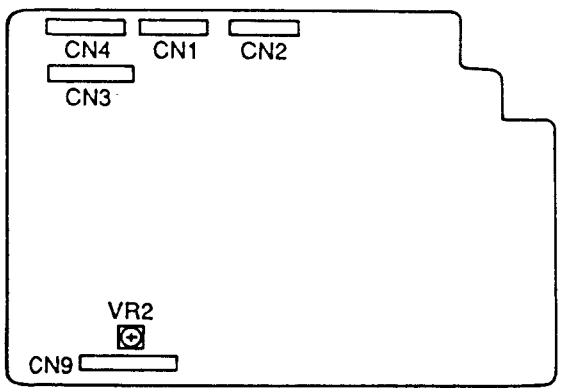
2. SCHEMATIC DIAGRAM OF LOOP SIMULATOR



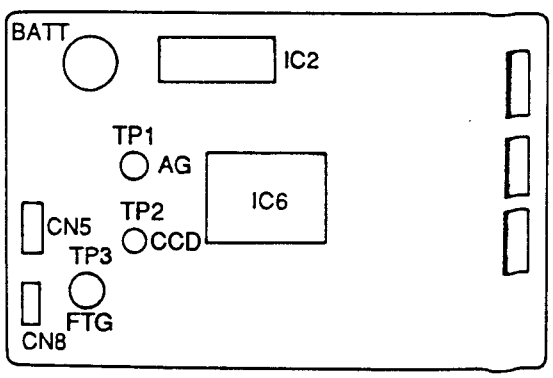
If a 48 V DC power supply is not available, a 20V DC power supply can be substituted. However, the variable resistor (0–500Ω) must be set to 0 ohms.

3. LOCATION OF TEST POINT AND VR

ANALOG BOARD
(Component View)

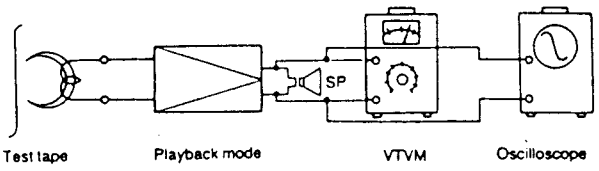
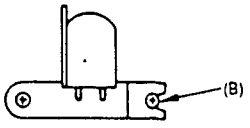
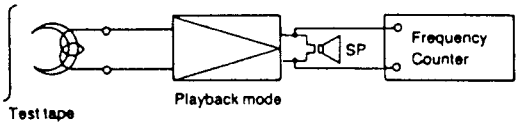


DIGITAL BOARD
(Component View)



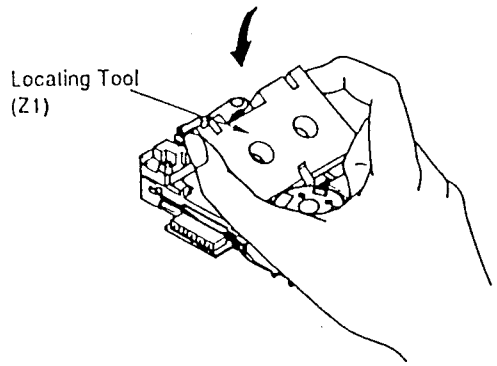
4. CASSETTE DECK ADJUSTMENT

Notes: 1. Make sure the heads are clean.
2. Make sure the capstan and pressure roller are clean.
3. Room temperature for measuring and adjusting: 20±5°C (68±9°F)
4. Test equipments are not treated as replacement parts.

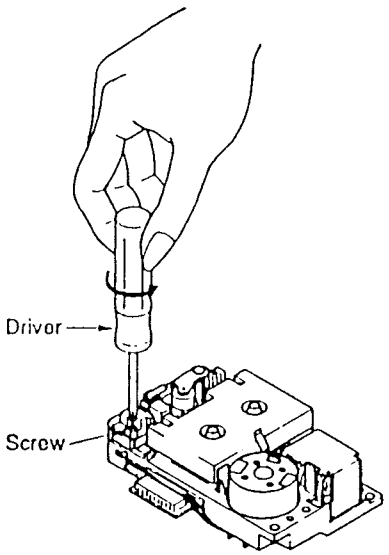
ITEM	MEASUREMENT & ADJUSTMENT	REMARKS
1. Head azimuth adjustment	1. Play back the test tape (QZZMWA or PQZZLCT2401A). 2. Adjust screw (B) shown in Fig. A for maximum output at SP terminal. (Test equipment connection is shown below.)  	• Record/playback head  Fig. A
2. Tape speed adjustment	1. Play back the test tape (QZZMWA or PQZZLCT2401A). 2. Adjust VR2 for 3000±50 Hz on frequency counter reading.  	

Note: Perform locating adjustment after changing or moving Erase Head or parts around it.

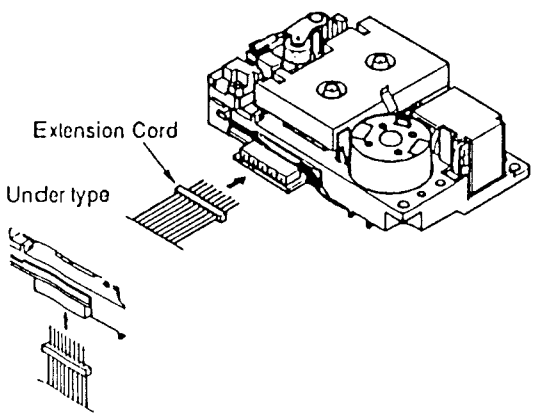
1 • Set the Locating Tool (Z1) on the DECK.



2 • Loosen the fixed screw of Erase Head.

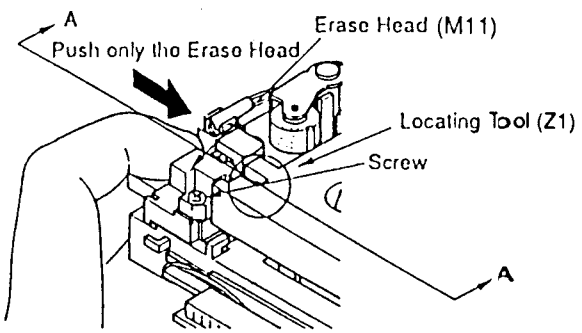


3 • Connect the DECK with the unit by extension cord and press the PLAY Button.



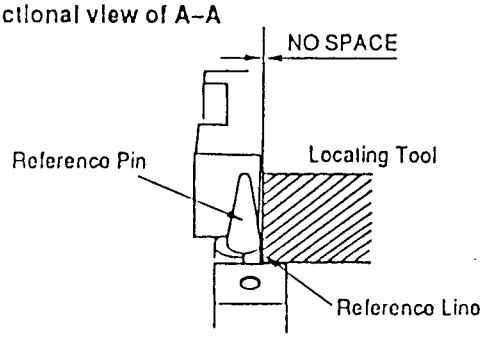
Note: Decks in some models are connected from under it by extension cord.

4 ① Push the back of Erase Head with finger to push only the top of Erase Head (M11) to the side of Locating Tool (Z1).
② Tighten the Erase Head Screw while keeping the state shown in step ①.



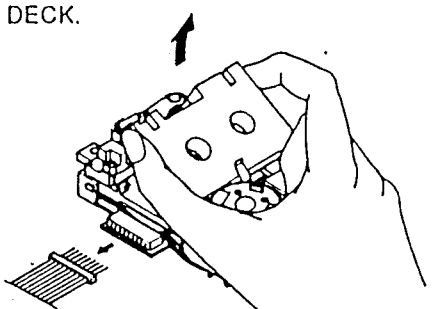
Note 1: Do not give any pressure to another part when you press the Erase Head (M11). Otherwise, the correct justification cannot be made.

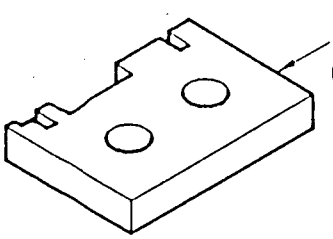
• Sectional view of A–A



Note 2: When attaching the Locating Tool to the Reference Pin, be sure to leave NO SPACE between them because the Reference Line is a standard of the deck's dimensions.

5 ① Press the STOP Button.
② Remove the Locating Tool (Z1) and extension cord from the DECK.





(Locating Tool)

5. CCD ADJUSTMENTS

Perform the following adjustment after replacing lens and CCD board.

PREPARATION:

1) Remove the CCD unit from set. (Refer to page 81.)
2) Make oscilloscope connections as shown in Fig. C.
3) Attach the CCD unit on the CCD TOOL.
4) Connect between CCD unit and digital board with extension cord (Part No. PQZZ8K15Z). (Refer to Fig. C.)
5) Connect between LED array and digital board with extension cord (Part No. PQZZ2K12 Z). (Refer to Fig. C.)
6) Power switch ON.
7) Press the PROGRAM button.
8) Press the #, 9, 0, 0, 0 and ✳ buttons.
9) Press the 5, 5 and 5 buttons.
10) Press the START button.

Notes:

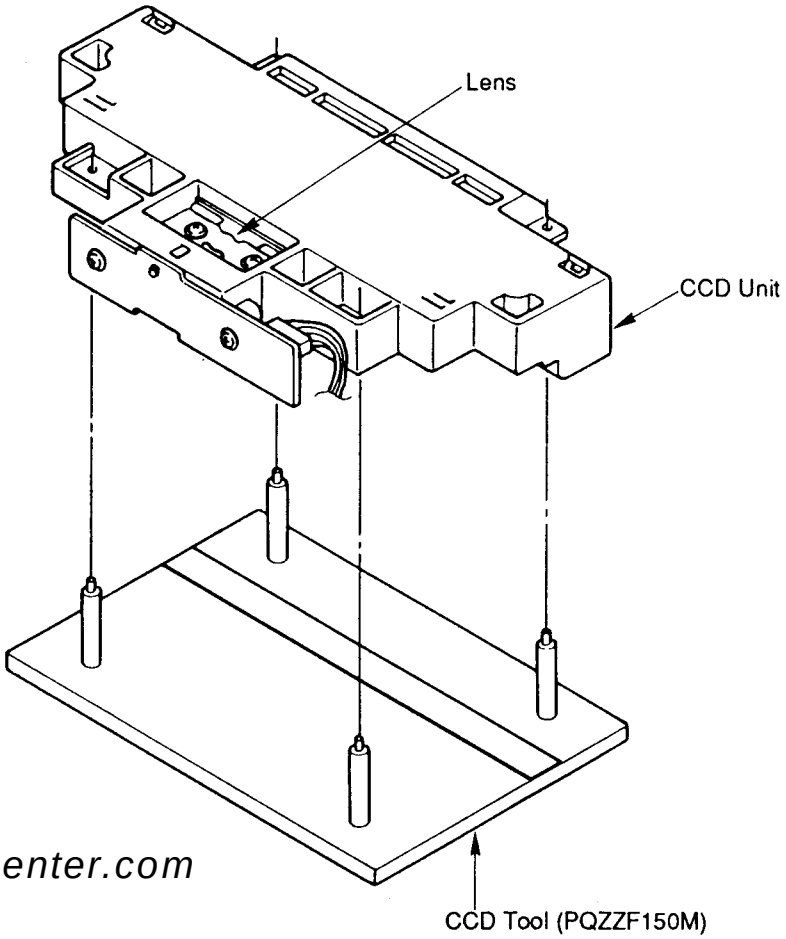
1) When replacing the lens, pay attention to the markings on the lens are white, yellow or orange. The number of the CCD spacers to use differs depending on the markings as follows.
   *Refer to page 199 for the location of the CCD spacers.

Marking on the lens	Number of CCD Spacer
Orange	0 (not used)
White	1
Yellow	2

2) Install the lens so that the making (White or Yellow or Orange) on it is upper side.
3) Do not touch the glass face of the lens with the bare hand.

Cleaning:

If the lens is dirty, clean it with a dry soft cloth.



Note:

Plase adjust with covering topside of the lens by hands in order not to let in outdoor daylight.

ADJUSTMENT:

LENS AND CCD READ POSITION ADJUSTMENT

1) Loosen the lens fixing screw and CCD board fixing screw.
2) Adjust the position of the lens and CCD board so that the waveform appears as shown in the figure below.
3) Fix the lens fixing screw and CCD board fixing screw.

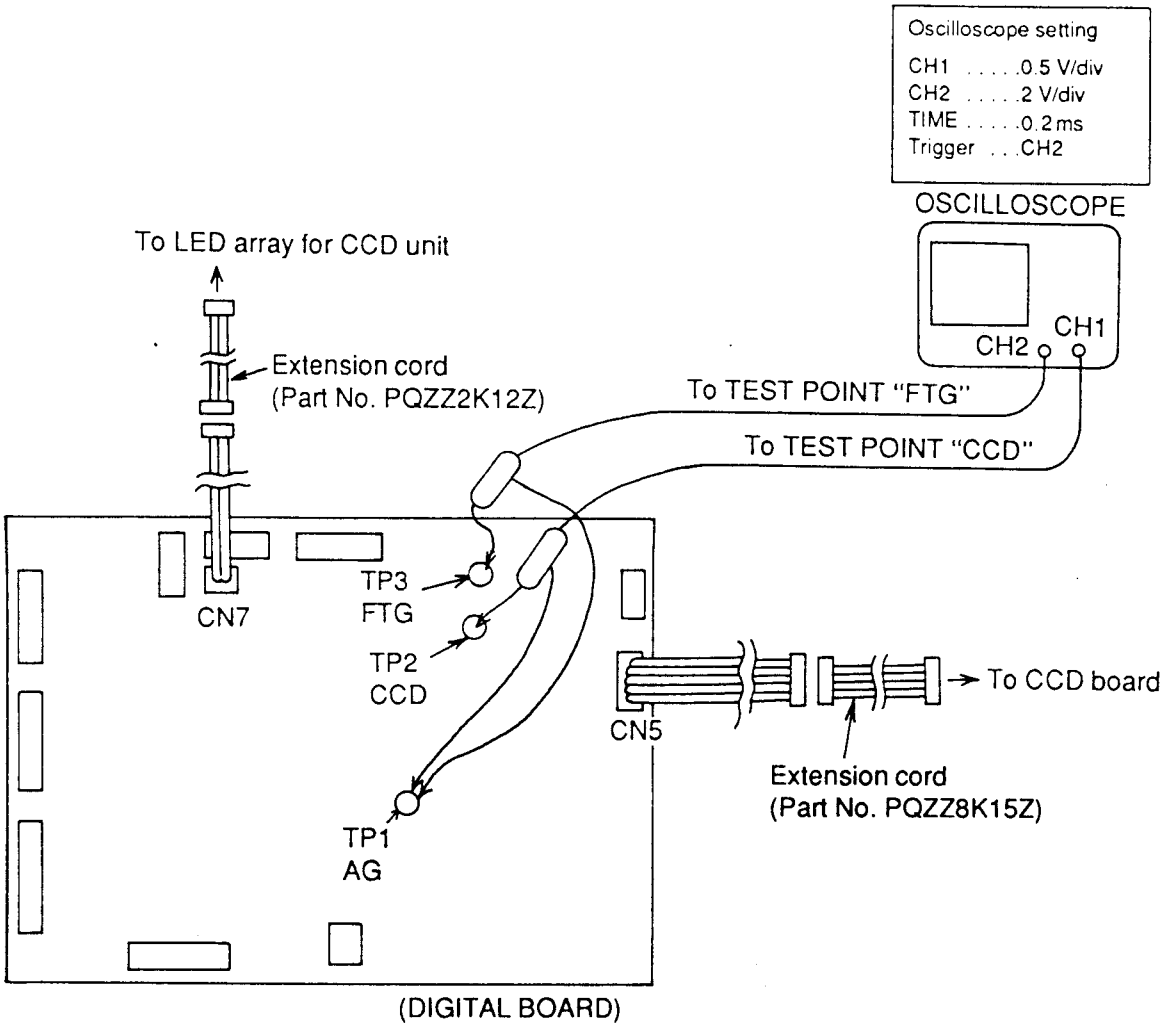
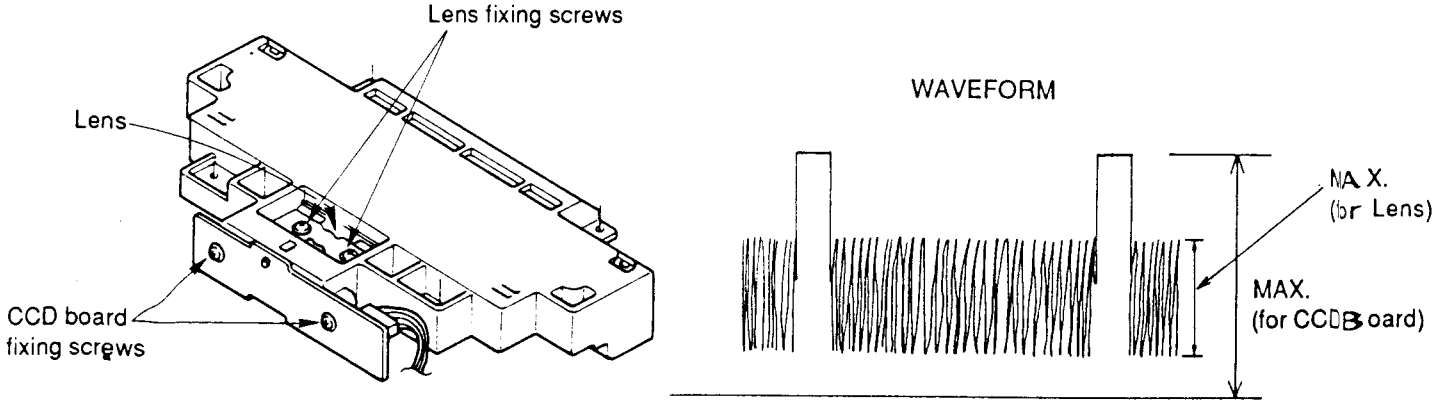


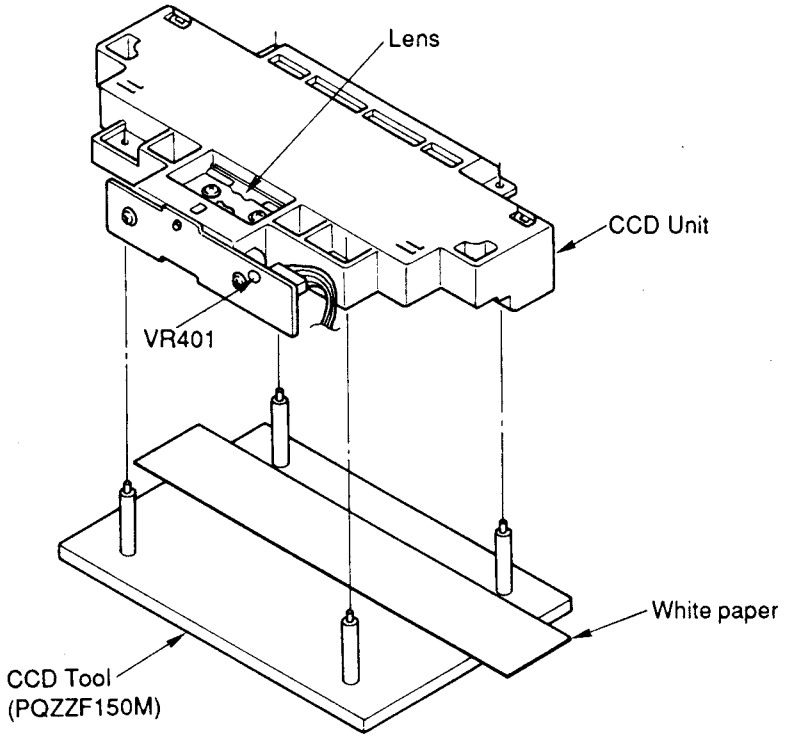
Fig. C



WHITE LEVEL ADJUSTMENT

1) Remove the CCD unit from CCD TOOL.
2) Attach the white paper on the CCD TOOL.
3) Attach the CCD unit on the CCD TOOL.
4) Adjust VR401 on the CCD board so that the waveform becomes 2 V.

Notes: 1. After the adjustment is finished, assemble the unit by reversing above procedure.
2. Please adjust with covering topside of the lens by hands in order not to let in outdoor daylight.



WAVEFORM

6. DOCUMENT READ START POSITION ADJUSTMENT

1) Power Switch ON.
2) Copy the document, and confirm the read start position of the document.
3) If get out of position, adjust the read position.
4) Press the PROGRAM button.
5) Press the #, 9, 0, 0, 0, ✳ and 5, 6, 3 buttons.
6) Press the ⬚,⬚, SET and PROGRAM buttons.

30
⋮ To move the image to the right direction
16 ↑
15 ← Standard (Default)
14 ↓
⋮ To move the image to the left direction
00

* The starting position of the reading shifts 1 mm as the number changes.

CIRCUIT OPERATIONS

TABLE OF CONTENTS

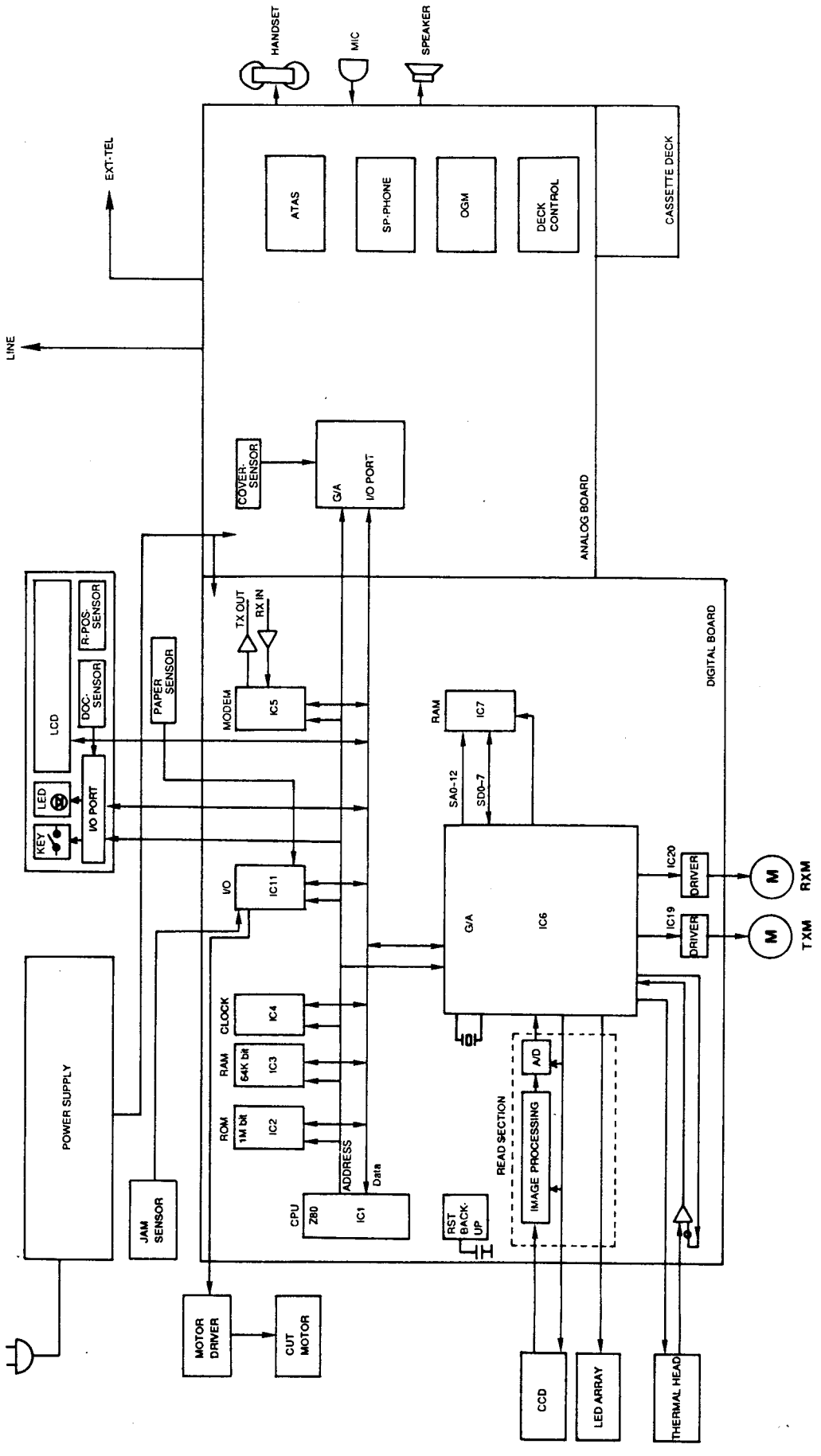
NOTE
The circuit diagram may be modified at any time with the development of new technology.

1. GENERAL BLOCK DIAGRAM

The control section will be explained as shown in the block diagram.

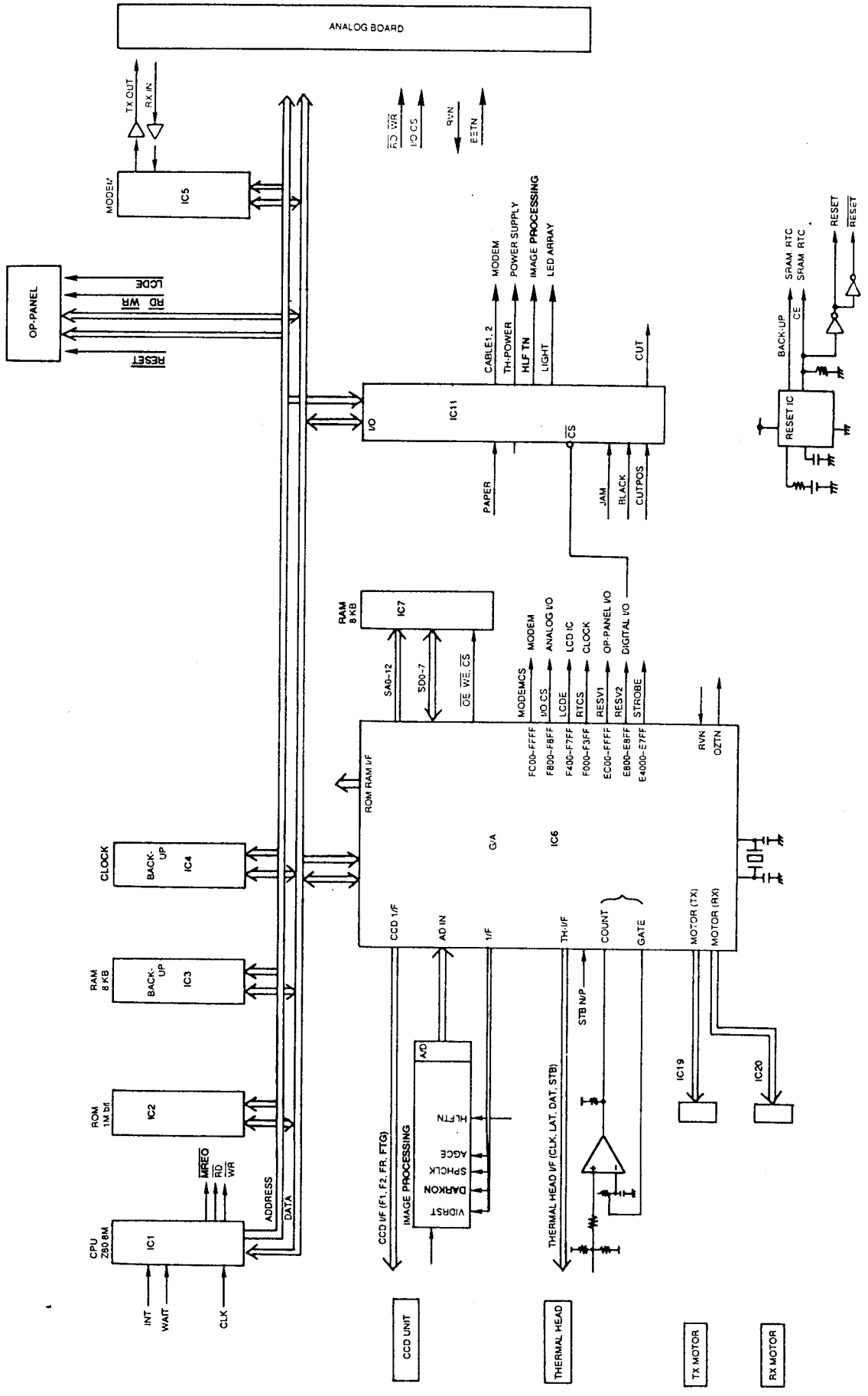
1) CPU (IC1) ..... The CPU fetchs and executes instructions from ROM, writes (reads) data to (from) RAM, writes commands to the gate array IC's and reads status information from gate array IC's.
2) ROM (IC2)..... Contains all of the program instructions for unit operations.
3) Static RAM (IC3) ..... This memory is used mainly for parameter working stroage area.
4) Static RAM (IC7)..... This memory is used mainly for image processing.
5) Gate Array (IC6)..... Composed mainly address decoder and modem control section. Control the general FAX operation.
6) I/O Port (IC9)..... Control the operation panel I/F.
7) MODEM (IC5) ..... Executes modulation and demodulation for FAX communications.
8) Read Section ..... Composed of the LED array light source, CCD image sensor and A/D converter to read transmitting documents
9) Thermal Head ..... Contains heating elements for dot matrix image printing.
10) Motor Driver (IC19, 20) ..... Drives the transmission motor, the reception motor and cut motor.
11) Reset Circuit (IC10) ..... Provides reset pulse to each of the major IC's.
12) I/O Port (IC11)..... Reads switches and writes to LED's.
13) Analog Board ..... Composed of ATAS circuit, ITS circuit and NCU circuit.
14) Sensor Section ..... Composed of cover open sensor, document sensor, recording paper sensor, cutter position switch,read position sensor and jam sensor.
15) Clock (IC4) ..... Backed up by a lithium battery.
16) Switching Power Supply Section..... Supplies +5V, +12 V, −12 V and +24 V to the unit.

General Block Diagram



2. CONTROL SECTION

2-1. BLOCK DIAGRAM



2-2. CPU (IC1)

The KX-F230 uses a Z80 equivalent CPU operating at 8 MHz. Many of the peripheral functions are handled by custom designed LSI gate arrays. As a result, the CPU only needs to process the results. Fetch, read and write cycle timing chart is shown below.

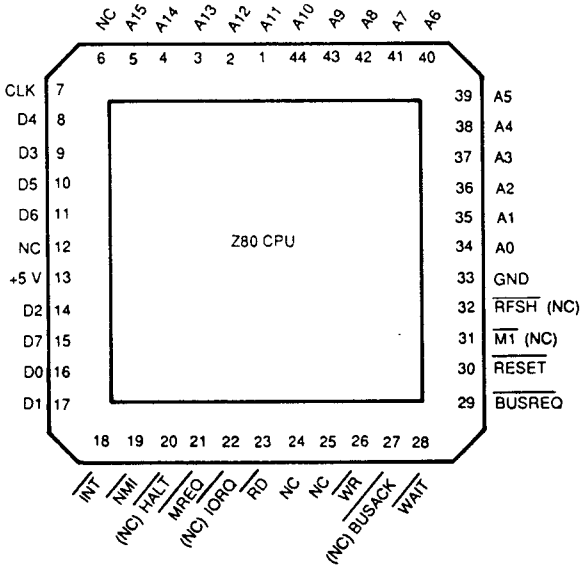


Figure 1. 44-Pin Chip Carrier Pin Assignments

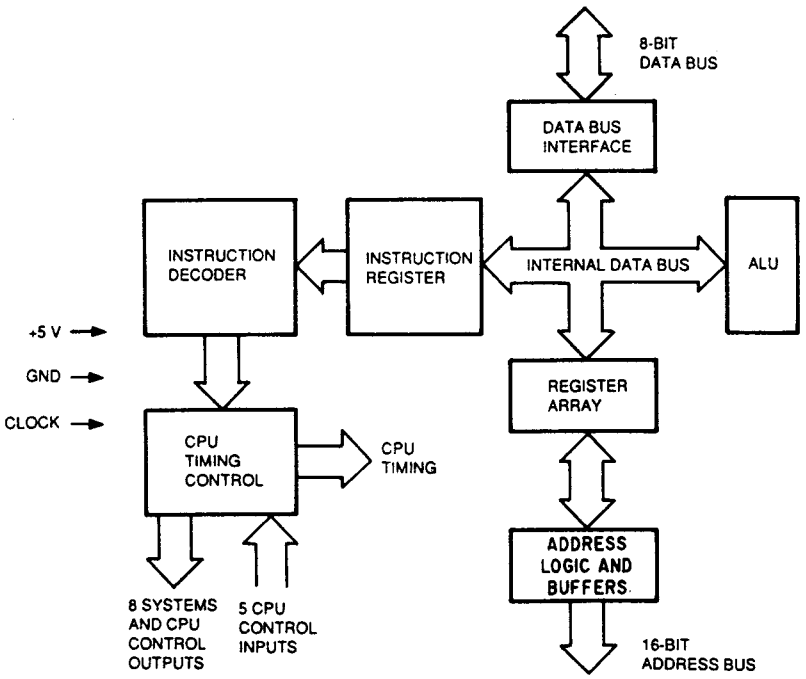


Figure 2. Z80C CPU Block Diagram

1) Pin Descriptions

$\overline{A0}$–$\overline{A15}$. *Address Bus* (output, active High, 3-state). A0–A15 form a 16-bit address bus. The Address Bus provides the address for memory data bus exchanges (up to 64K bytes) and for I/O device exchanges.

$\overline{BUSREQ}$. *Bus Request* (input, active Low). Bus Request has a higher priority than $\overline{NMI}$ and is always recognized at the end of the current machine cycle. $\overline{BUSREQ}$ forces the CPU address bus, data bus, and control signals $\overline{MREQ}$, $\overline{IORQ}$, $\overline{RD}$, and $\overline{WR}$ to go to a high-impedance state so that other devices can control these lines. $\overline{BUSREQ}$ is nomally wired-OR and requires an external pullup for these applications. Extended $\overline{BUSREQ}$ periods due to extensive DMA operations can prevent the CPU from properly refreshing dynamic RAMs.

D0–D7. *Data Bus* (input/output, active High, 3-state). D0–D7 constitute an 8-bit bidirectional data bus, used for data exchanges with memory and I/O.

$\overline{INT}$. *Interrupt Request* (input, active Low). Interrupt Request is generated by I/O devices. The CPU honors a request at the end of the current instruction if the internal software-controlled interrupt enable flip-flop (IFF) is enabled $\overline{INT}$ is normally wired-OR and requires an external pullup for these applications.

$\overline{MREQ}$. *Memory Request* (output, active Low, 3-state). $\overline{MREQ}$ indicates that the address bus holds a valid address for a memory read or memory write operation.

$\overline{NMI}$. *Non-Maskable Interrupt* (input, negative edgetriggered). $\overline{NMI}$ has a higher priority than $\overline{INT}$, $\overline{NMI}$ is always recognized at the end of the current instruction, independent of the status of the interrupt enable flip-flop, and automatically forces the CPU to restart at location 0066H.

$\overline{RD}$. *Read* (output, active Low, 3-state). $\overline{RD}$ indicates that the CPU wants to read data from memory or an I/O device. The addressed I/O device or memory should use this signal to gate data onto the CPU data bus.

$\overline{RESET}$. *Reset* (input, active Low). $\overline{RESET}$ initializes the CPU as follows: it resets the interrupt enable flip-flop, clears the PC and Registers I and R, and sets the interrupt status to Mode 0. During reset time, the address and data bus go to a high-impedance state, and all control output signals go to the inactive state. Note that $\overline{RESET}$ must be active for a minimum of three full clock cycles before the reset operation is complete.

$\overline{WAIT}$. *Wait* (input, active Low). $\overline{WAIT}$ indicates to the CPU that the addressed memory or I/O devices are not ready for a data tranfer. The CPU continues to enter a Wait state as long as this signal is active. Extended $\overline{WAIT}$ periods can prevent the CPU from properly refreshing dynamic memory.

$\overline{WR}$. *Write* (output, active Low, 3-state). $\overline{WR}$ indicates that the CPU data bus holds valid data to be stored at the addressed memory or I/O location.

2) CPU Timing

The Z80 CPU executes instructions by proceeding through a specific sequence of operations:

- Memory read or write
- I/O device read or write
- Interrupt acknowledge

The basic clock period is referred to as a T time or cycle and three or more T cycles make up a machine cycle (M1, M2 or M3 for instance). Machine cycles can be extended either by the CPU automatically inserting one or more Wait states or by the insertion of one or more Wait states by the user.

Instruction Opcode Fetch The CPU places the contents of the Program Counter (PC) on the address bus at the start of the cycle (Figure 1). Approximately one-half clock cycle later, $\overline{MREQ}$ goes active. When active, $\overline{RD}$ indicates that the memory data can be enabled onto the CPU data bus.

The CPU samples the $\overline{WAIT}$ input with the falling edge of clock state T2. During clock states T3 and T4 of an $\overline{M1}$ cycle, dynamic RAM refresh can occur while the CPU starts decoding and executing the instrucition. When the Refresh Control signal becomes active, refreshing of dynamic memory can take place.

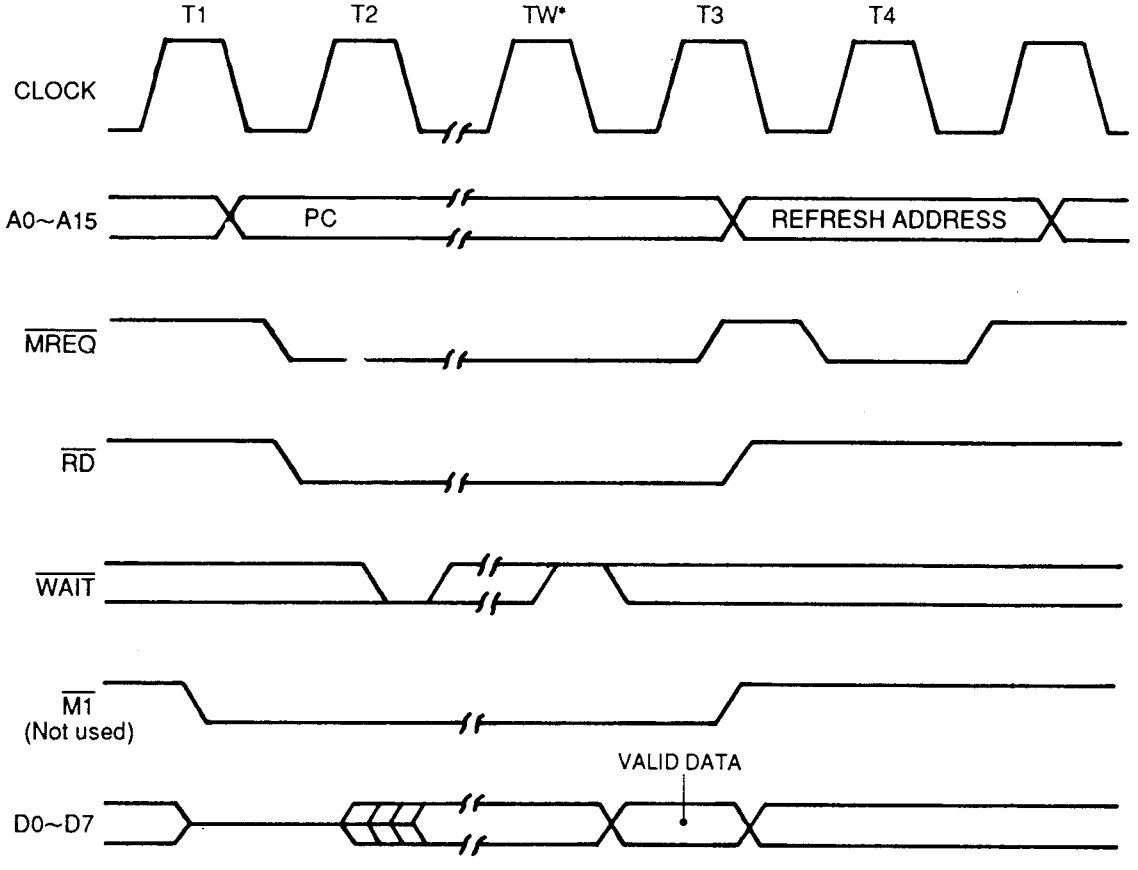


Figure 1. Instruction Opcode Fetch

Memory Read or Write Cycles Figure 2 shows the timing of memory read or write cycles other than an opcode fetch ($\overline{M1}$) cycle. The $\overline{MREQ}$ and $\overline{RD}$ signals function exactly as in the fetch cycle. In a memory write cycle, $\overline{MREQ}$ also becomes active when the address bus is stable. The $\overline{WR}$ line is active when the data bus is stable, so that it can be used directly as an R/$\overline{W}$ pulse to most semiconductor memories.

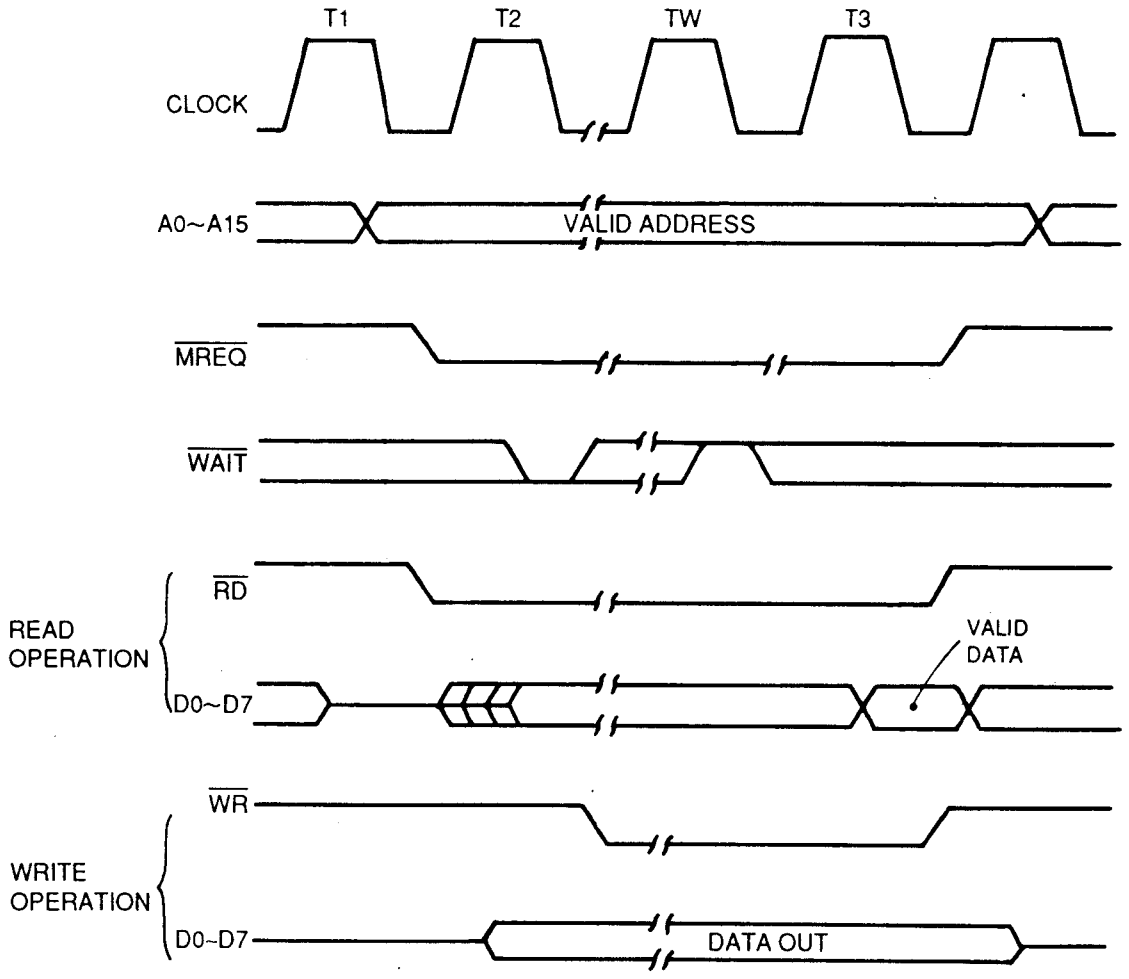
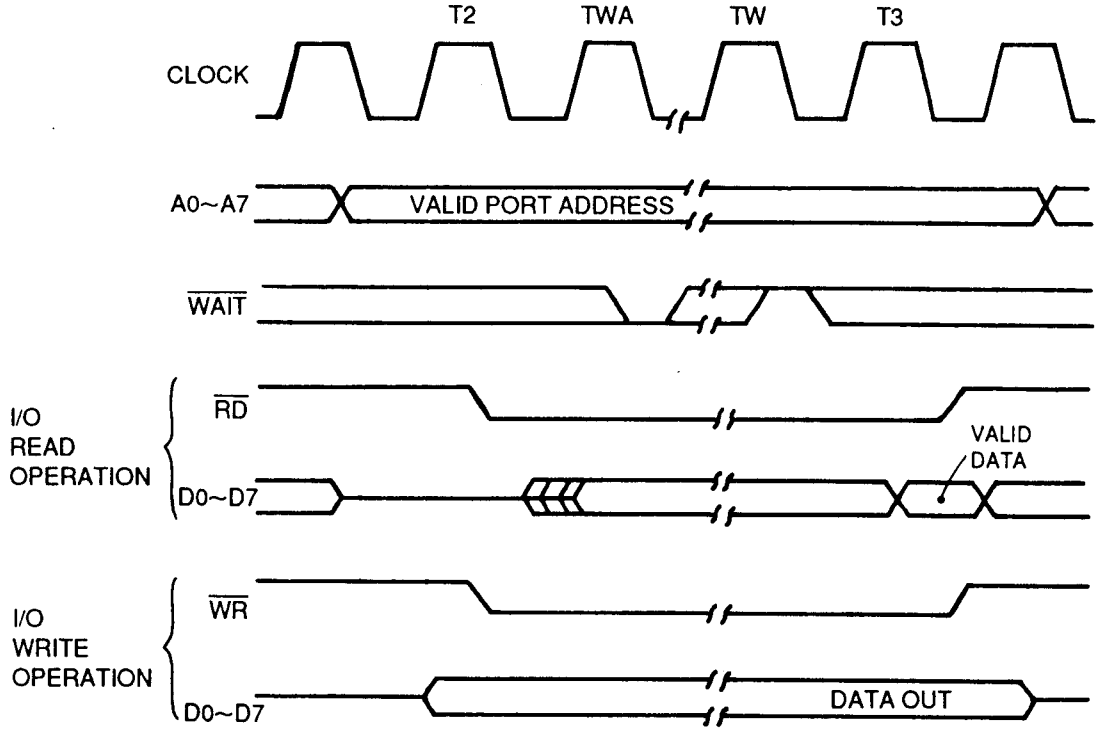


Figure 2. Memory Read or Write Cycles

Input or Output Cycles Figure 3 shows the timing for an I/O read or I/O write operation. During I/O operations, the CPU automatically inserts a single Wait state (TWA). This extra Wait state allows sufficient time for an I/O port to decode the address from the port addres lines.

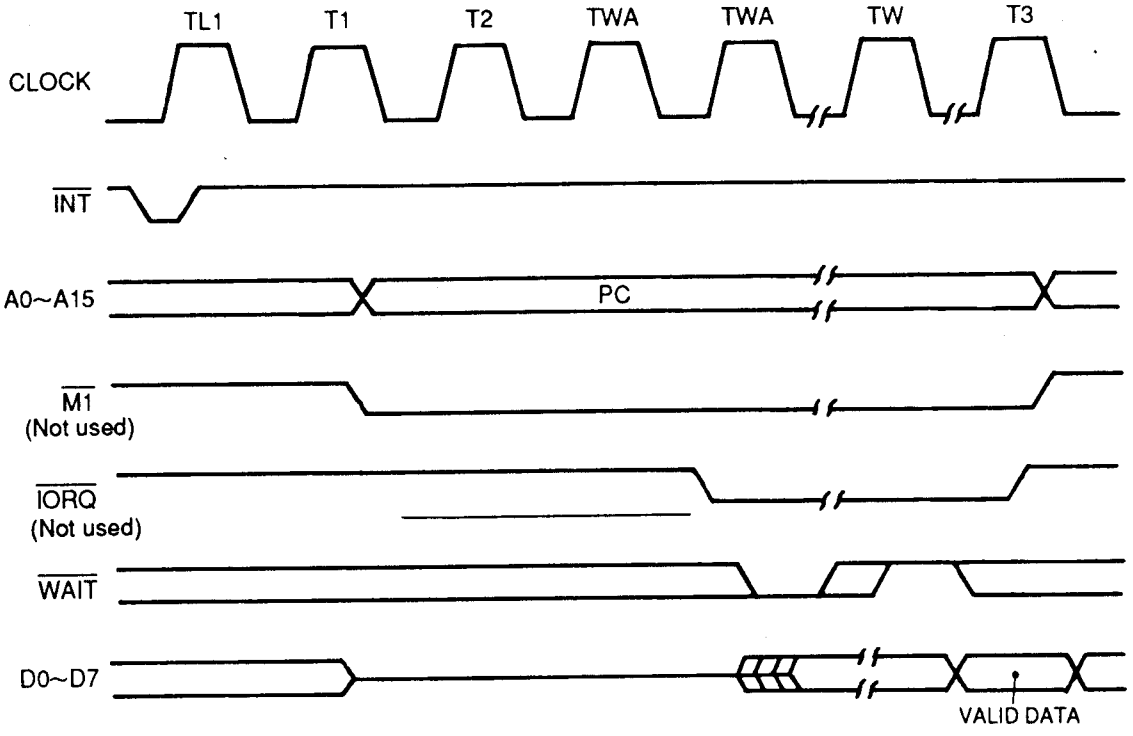


TWA=One wait cycle automatically inserted by CPU

Figure 3. Input or Output Cycles

Interrupt Request/Acknowledge Cycle The CPU samples the interrupt signal with the rising edge of the last clock cycle at the end of any instruction (Figure 4). When an interrupt is accepted, a special $\overline{M1}$ cycle is generated.

During this $\overline{M1}$ cycle, $\overline{IORQ}$ becomes active (instead of $\overline{MREQ}$) to indicate that the interrupting device can place an 8-bit vector on the data bus. The CPU automatically adds two Wait states to this cycle.



NOTES: 1) TL1=Last state of any instruction cycle
2) TWA=Wait cycle automatically inserted by CPU

Figure 4. Interrupt Request/Acknowledge Cycle

2-3. MEMORY MAP

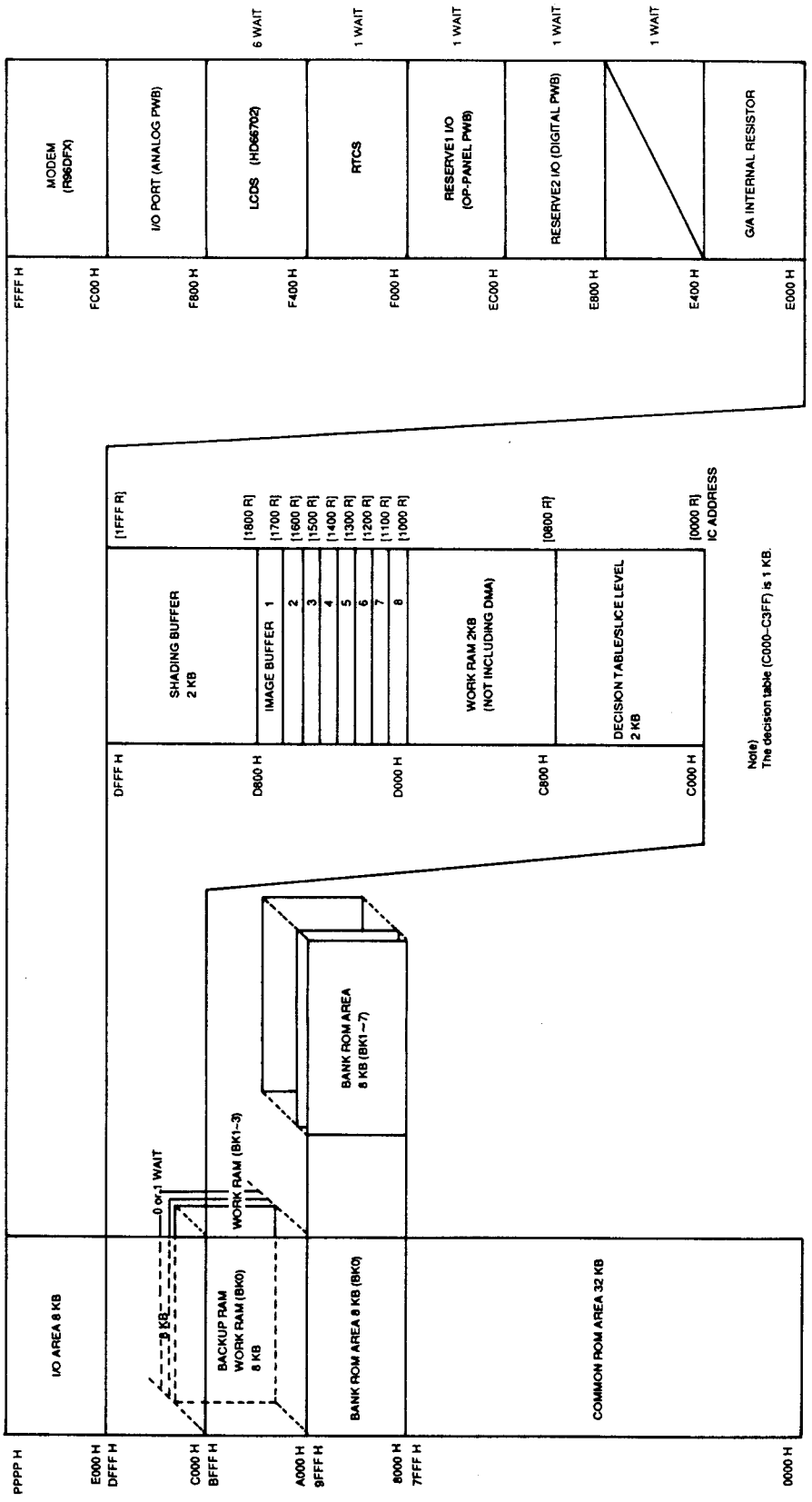


Fig. 1

2-4. ROM (IC2)

This 128 KB ROM (EPROM or MASK ROM) has 32 KB of common area and bank area (BK0~BK7).
The capacity of each bank is 8 KB. (The other 32 KB cannot be accessed.)
The addresses of the common area are from 0000H to 7FFFH, and the addresses from 8000H to 9FFFH are for the bank area.

2-5. RAM (IC3)

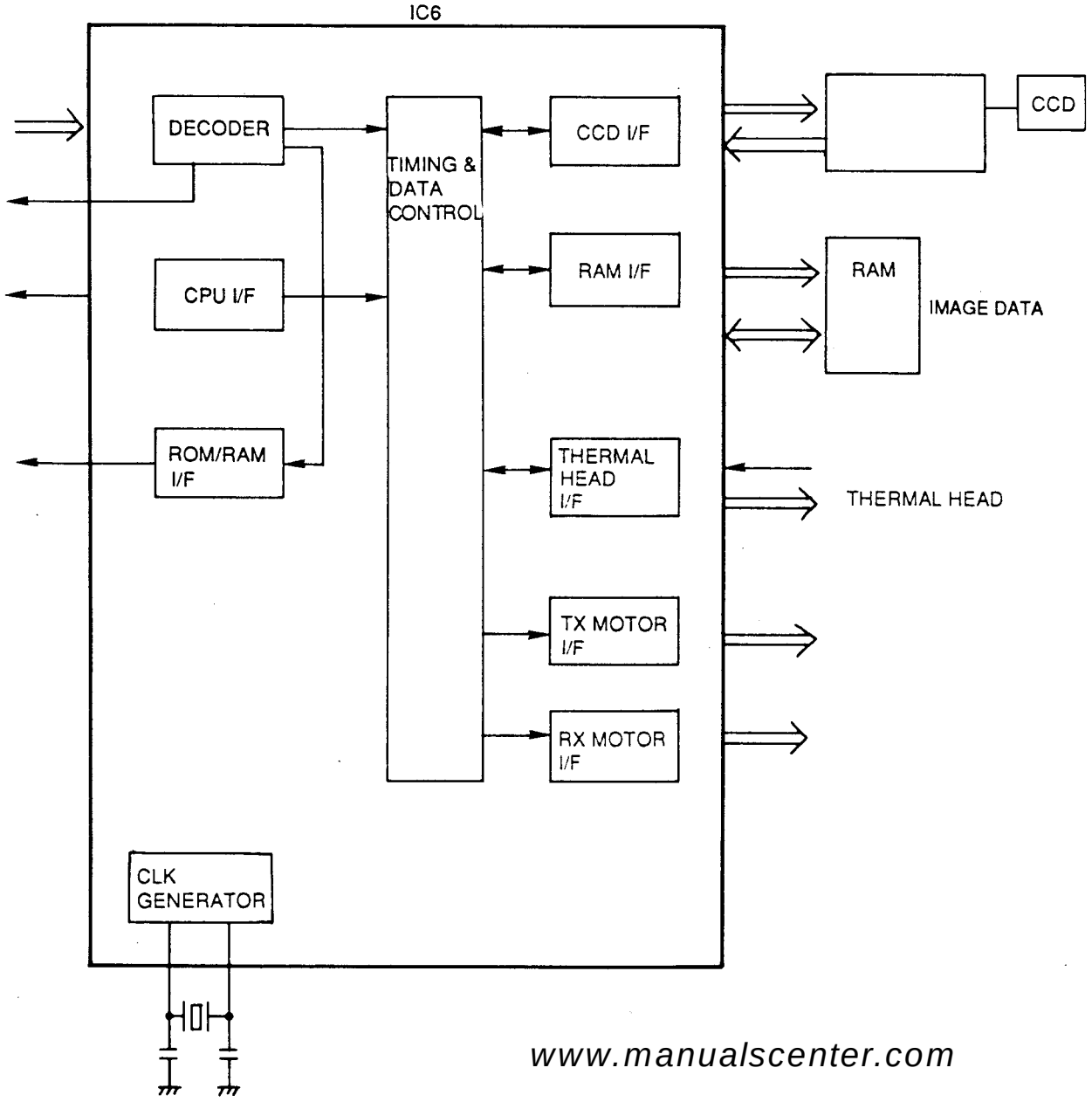
The 8 KB IC is used for RAM configuring the bank.
The lithium battery retains the memory of IC3.
A user entered telephone number and a user identification, etc. are stored in them. The addresses are from A000H to BFFFH.

2-6. GATE ARRAY (IC6)

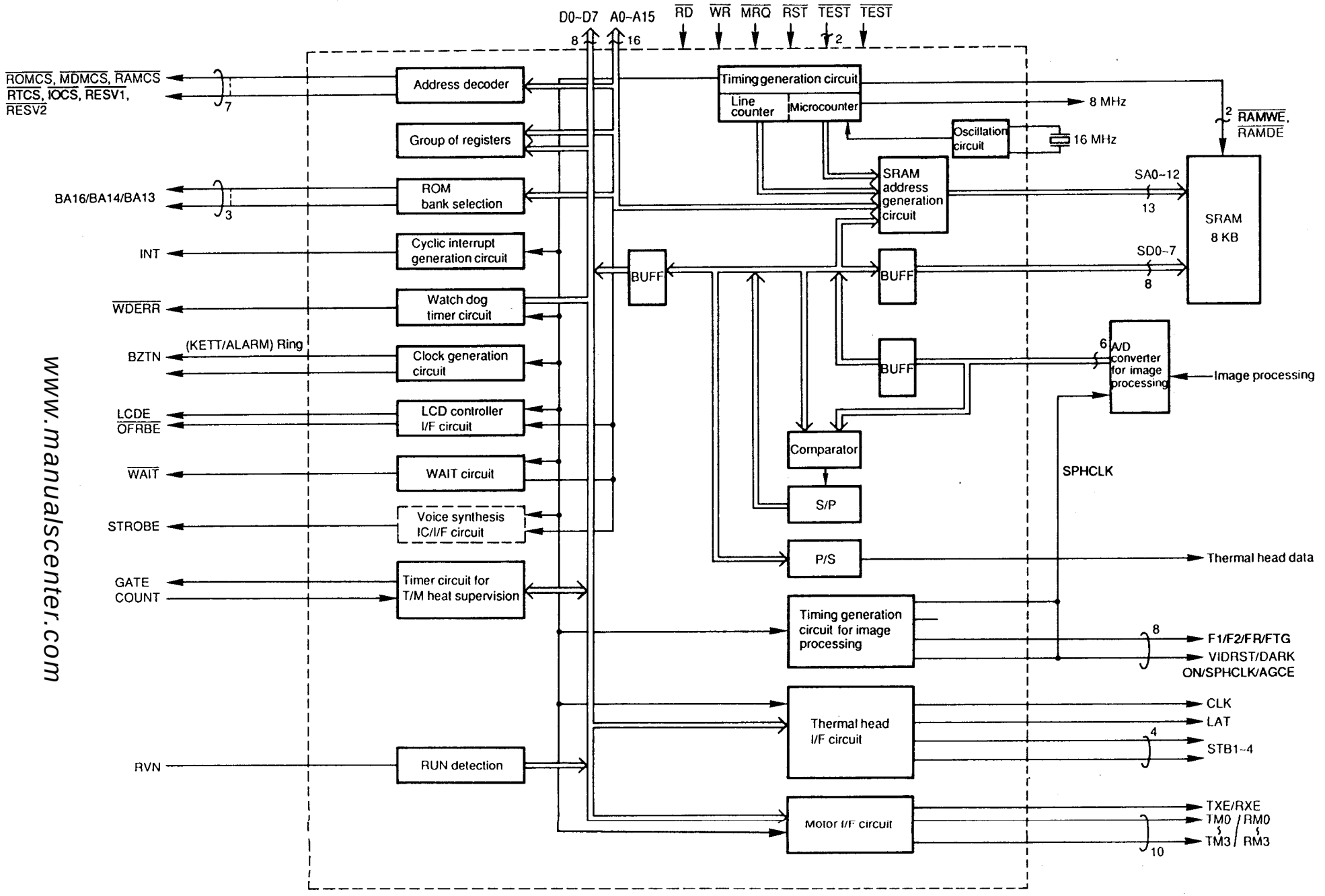
This custom IC is used for general FAX operation.

1) **DECODER:** Decodes the address of the CPU (IC1) according to the memory map (Fig. 1).
2) **CPU I/F:** Outputs the WAIT and INTERRUPT signals.
3) **ROM/RAM I/F:** Controls the SELECT signal of ROM or RAM, and ROM bank switching.
4) **CCD I/F:** Controls document reading. (Refer **to page 120 for details.**)
5) **RAM I/F:** Controls reading/writing of the data storage RAM (IC7).
6) **THERMAL HEAD I/F:** Transmits the recorded data to the thermal head.
7) **TX MOTOR I/F:** Controls the transmission motor which feeds the document.
8) **RX MOTOR I/F:** Controls the receiving motor which feeds the recording paper.

Block Diagram



IC6 Block Diagram

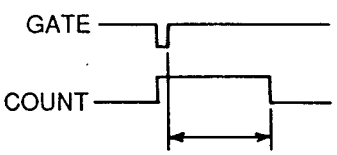
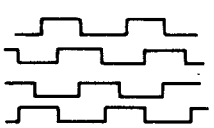


IC6

9) Explanation of Pin Distribution (IC6)

SIGNAL	PIN NO.	I/O	FUNCTION	DESCRIPTION	CONNECTION
<CPU>					
A0	97	I	ADDRESS BUS	CPU (IC1) ADDRESS BUS	CPU (IC1) ADDRESS BUS
A1	96	I	ADDRESS BUS	CPU (IC1) ADDRESS BUS	CPU (IC1) ADDRESS BUS
A2	95	I	ADDRESS BUS	CPU (IC1) ADDRESS BUS	CPU (IC1) ADDRESS BUS
A3	93	I	ADDRESS BUS	CPU (IC1) ADDRESS BUS	CPU (IC1) ADDRESS BUS
A4	92	I	ADDRESS BUS	CPU (IC1) ADDRESS BUS	CPU (IC1) ADDRESS BUS
A5	91	I	ADDRESS BUS	CPU (IC1) ADDRESS BUS	CPU (IC1) ADDRESS BUS
A6	90	I	ADDRESS BUS	CPU (IC1) ADDRESS BUS	CPU (IC1) ADDRESS BUS
A7	89	I	ADDRESS BUS	CPU (IC1) ADDRESS BUS	CPU (IC1) ADDRESS BUS
A8	88	I	ADDRESS BUS	CPU (IC1) ADDRESS BUS	CPU (IC1) ADDRESS BUS
A9	87	I	ADDRESS BUS	CPU (IC1) ADDRESS BUS	CPU (IC1) ADDRESS BUS
A10	86	I	ADDRESS BUS	CPU (IC1) ADDRESS BUS	CPU (IC1) ADDRESS BUS
A11	82	I	ADDRESS BUS	CPU (IC1) ADDRESS BUS	CPU (IC1) ADDRESS BUS
A12	81	I	ADDRESS BUS	CPU (IC1) ADDRESS BUS	CPU (IC1) ADDRESS BUS
A13	80	I	ADDRESS BUS	CPU (IC1) ADDRESS BUS	CPU (IC1) ADDRESS BUS
A14	79	I	ADDRESS BUS	CPU (IC1) ADDRESS BUS	CPU (IC1) ADDRESS BUS
A15	78	I	ADDRESS BUS	CPU (IC1) ADDRESS BUS	CPU (IC1) ADDRESS BUS
D0	65	I/O	DATA BUS	CPU (IC1) DATA BUS	CPU (IC1) DATA BUS
D1	64	I/O	DATA BUS	CPU (IC1) DATA BUS	CPU (IC1) DATA BUS
D2	71	I/O	DATA BUS	CPU (IC1) DATA BUS	CPU (IC1) DATA BUS
D3	74	I/O	DATA BUS	CPU (IC1) DATA BUS	CPU (IC1) DATA BUS
D4	75	I/O	DATA BUS	CPU (IC1) DATA BUS	CPU (IC1) DATA BUS
D5	73	I/O	DATA BUS	CPU (IC1) DATA BUS	CPU (IC1) DATA BUS
D6	72	I/O	DATA BUS	CPU (IC1) DATA BUS	CPU (IC1) DATA BUS
D7	66	I/O	DATA BUS	CPU (IC1) DATA BUS	CPU (IC1) DATA BUS
$\overline{MREQ}$	60	I	MEMORY REQUEST Signal	Memory Access Request Signal from the CPU (IC1)	CPU (IC1) (21)
$\overline{RD}$	62	I	Read Signal	Read Signal from the CPU (IC1)	CPU (IC1) (23)
$\overline{WR}$	63	I	Write Signal	Write Signal from the CPU (IC1)	CPU (IC1) (26)
$\overline{WAIT}$	59	O	Wait Signal	Wait signal that the memory or I/O devices are not ready for a data transfer.	CPU (IC1) (28)
$\overline{INT}$	61	O	Interrupt Signal	Interrupt Request signal	CPU (IC1) (18)
8 MHZ	77	O	Clock Signal	Used mainly to synchronize with the CPU (IC1).	CPU (IC1) (7)
<ROM/RAM>					
BA16	100	O	ROM ADDRESS 16	ROM Bank Select Signal	ROM (IC2) (2)
BA14	99	O	ROM ADDRESS 14	ROM Bank Select Signal	ROM (IC2) (29)
BA13	98	O	ROM ADDRESS 13	ROM Bank Select Signal	ROM (IC2) (28)
$\overline{ROMCS}$	58	O	ROM Chip Select Signal	ROM Chip Select Signal equipped on the 0000H~9FFFH.	ROM (IC2) (22)
$\overline{RACS}$	101	O	RAM Chip Select Signal	RAM Chip Select Signal equipped on the A000H~BFFFH.	IC23 (1)

SIGNAL	PIN NO.	I/O	FUNCTION	DESCRIPTION	CONNECTION
<CCD I/F>					
F1	105	O	Transfer Clock 1 for CCD		Connector 5 (2)
F2	106	O	Transfer Clock 2 for CCD		Connector 5 (3)
FR	107	O	Reset Clock for CCD		Connector 5 (4)
FTG	108	O	Shift Clock for CCD		Connector 5 (5)
VD0	115	I	A/D Data, LSB		IC12 (1)
VD1	114	I	A/D Data		IC12 (2)
VD2	112	I	A/D Data		IC12 (4)
VD3	111	I	A/D Data		IC12 (5)
VD4	110	I	A/D Data		IC12 (6)
VD5	109	I	A/D Data, MSB		IC12 (7)
AGCE	116	O	AGC Range Specification Set		
VIDRST	117	O	Clock for Regenerate Direct Current		IC17 (9)
DARKON	120	O	Clock for Regenerate Black Level		IC17 (11)
SPHCLK	121	O	Sample Hold Clock		IC17 (10)
<RAM I/F>					
SA0	9	O	SRAM ADDRESS BUS	ADDRESS BUS to SRAM (IC7)	SRAM (IC7) (10)
SA1	10	O	SRAM ADDRESS BUS	ADDRESS BUS to SRAM (IC7)	SRAM (IC7) (9)
SA2	12	O	SRAM ADDRESS BUS	ADDRESS BUS to SRAM (IC7)	SRAM (IC7) (8)
SA3	13	O	SRAM ADDRESS BUS	ADDRESS BUS to SRAM (IC7)	SRAM (IC7) (7)
SA4	14	O	SRAM ADDRESS BUS	ADDRESS BUS to SRAM (IC7)	SRAM (IC7) (6)
SA5	20	O	SRAM ADDRESS BUS	ADDRESS BUS to SRAM (IC7)	SRAM (IC7) (5)
SA6	21	O	SRAM ADDRESS BUS	ADDRESS BUS to SRAM (IC7)	SRAM (IC7) (4)
SA7	22	O	SRAM ADDRESS BUS	ADDRESS BUS to SRAM (IC7)	SRAM (IC7) (3)
SA8	133	O	SRAM ADDRESS BUS	ADDRESS BUS to SRAM (IC7)	SRAM (IC7) (21)
SA9	134	O	SRAM ADDRESS BUS	ADDRESS BUS to SRAM (IC7)	SRAM (IC7) (23)
SA10	135	O	SRAM ADDRESS BUS	ADDRESS BUS to SRAM (IC7)	SRAM (IC7) (24)
SA11	2	O	SRAM ADDRESS BUS	ADDRESS BUS to SRAM (IC7)	SRAM (IC7) (25)
SA12	23	O	SRAM ADDRESS BUS	ADDRESS BUS to SRAM (IC7)	SRAM (IC7) (2)
SD0	6	I/O	SRAM DATA BUS	SRAM (IC7) DATA BUS	SRAM (IC7) (11)
SD1	5	I/O	SRAM DATA BUS	SRAM (IC7) DATA BUS	SRAM (IC7) (12)
SD2	4	I/O	SRAM DATA BUS	SRAM (IC7) DATA BUS	SRAM (IC7) (13)
SD3	3	I/O	SRAM DATA BUS	SRAM (IC7) DATA BUS	SRAM (IC7) (15)
SD4	132	I/O	SRAM DATA BUS	SRAM (IC7) DATA BUS	SRAM (IC7) (16)
SD5	131	I/O	SRAM DATA BUS	SRAM (IC7) DATA BUS	SRAM (IC7) (17)
SD6	130	I/O	SRAM DATA BUS	SRAM (IC7) DATA BUS	SRAM (IC7) (18)
SD7	129	I/O	SRAM DATA BUS	SRAM (IC7) DATA BUS	SRAM (IC7) (19)
$\overline{\text{RAMOE}}$	7	O	RAM Output Enable	SRAM (IC7) DATA Output Enable Signal	SRAM (IC7) (22)
$\overline{\text{RAMWE}}$	8	O	RAM Write Enable	SRAM (IC7) DATA Write Pulse	SRAM (IC7) (27)

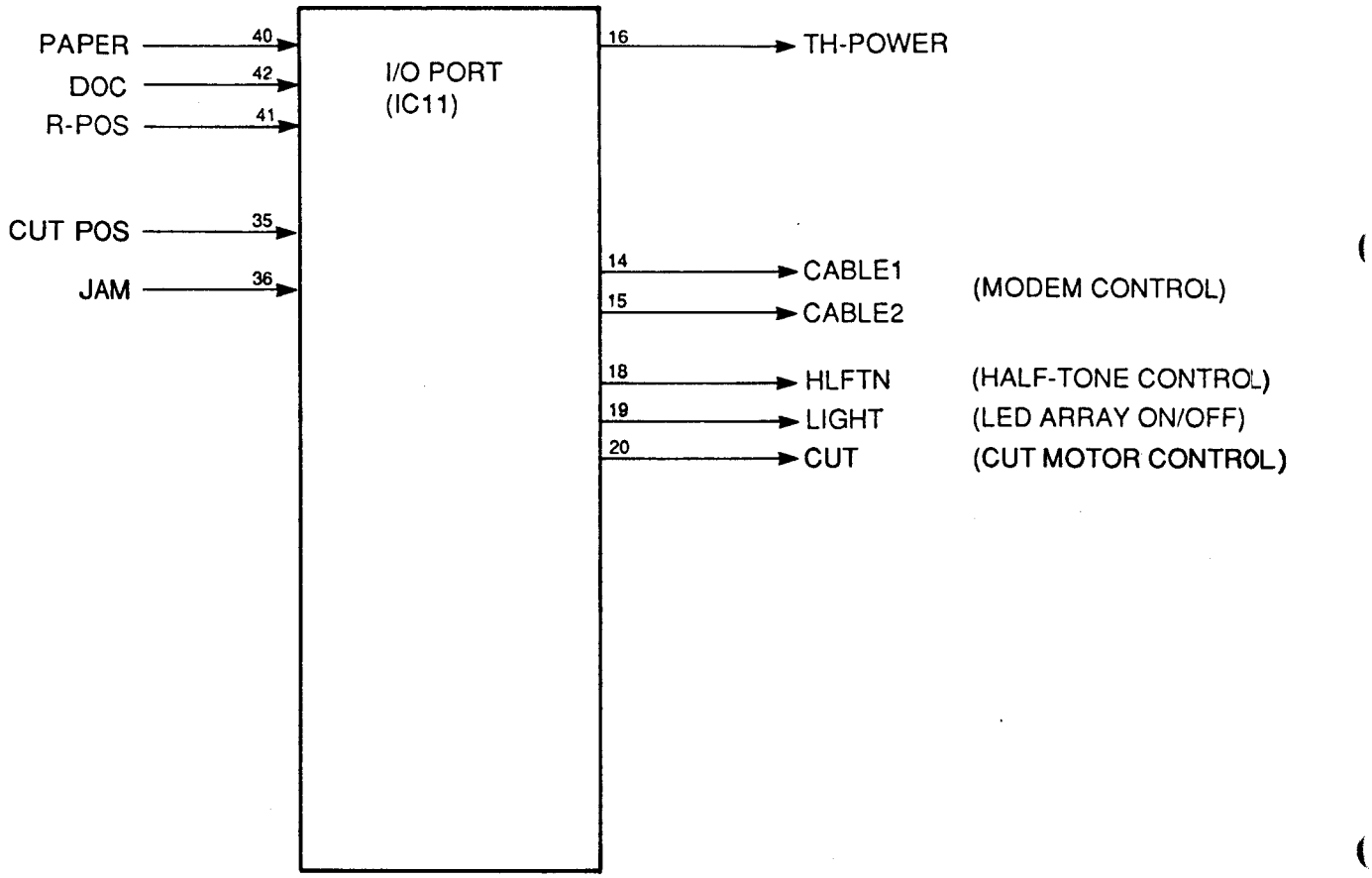
SIGNAL	PIN NO.	I/O	FUNCTION	DESCRIPTION	CONNECTION
<THERMAL HEAD I/F>					
THDAT	52	O	Outputs the Printout Data.	Refer to Thermal Head Section on P. 118 for details.	Connector 6 (1)
THCLK	53	O	Transfer Clock		
THLAT	54	O	Latch Pulse		Connector 6 (2)
STB 1	45	O	Strobe Signal		Connector 6 (7)
STB 2	46	O	Strobe Signal		Connector 6 (6)
STB 3	47	O	Strobe Signal		Connector 6 (5)
STB 4	49	O	Strobe Signal		Connector 6 (4)
STB NP	29	I	Strobe Polarity Switching	H: Plus Pulse L: Minus Pulse	
GATE	55	O	Gate Signal for Count		
COUNT	57	I	Count Signal	The internal counter performs time counting.	
<TX-MOTOR I/F>					
TM0	122	O	Transmit Motor Magnetizing Signal		Motor Driver (IC19) (7)
TM1	123	O	Transmit Motor Magnetizing Signal		Motor Driver (IC19) (6)
TM2	125	O	Transmit Motor Magnetizing Signal		Motor Driver (IC19) (5)
TM3	126	O	Transmit Motor Magnetizing Signal		Motor Driver (IC19) (4)
TXE	127	O	Transmit Motor Trigger	Motor Driver Control Signal (Control +24 V)	Motor Driver (IC19) (2)
<RX-MOTOR I/F>					
RM0	30	O	Receive Motor Magnetizing Signal	The timing chart is shown below.	Motor Driver (IC20) (4)
RM1	31	O	Receive Motor Magnetizing Signal		Motor Driver (IC20) (3)
RM2	32	O	Receive Motor Magnetizing Signal		Motor Driver (IC20) (2)
RM3	33	O	Receive Motor Magnetizing Signal		Motor Driver (IC20) (1)
RXE	36	O	Receive Motor Trigger	Motor Driver Control Signal (Controls +24 V)	Motor Driver (IC20) (6)

SIGNAL	PIN NO.	I/O	FUNCTION	DESCRIPTION	CONNECTION
<CLOCK>					
SCI	18	I	16 MHz Signal	Oscillation Circuit Buffer Input Signal	
SCO	19	O	16 MHz Signal	Oscillation Circuit Buffer Output Signal	
<SELECT SIGNAL>					
$\overline{\text{MDMCS}}$	44	O	MODEM Chip Select Signal	MODEM (IC5) Chip Select Signal	MODEM (IC5) (60)
$\overline{\text{I/O CS}}$	43	O	I/O PORT (IC11) Chip Select Signal	I/O PORT (IC11) in the ANALOG Board Chip Select Signal	Connector 1 (3) to ANALOG Board
$\overline{\text{RESV2}}$	40	O	I/O PORT (IC11) Chip Select Signal	I/O PORT (IC11) Chip Select Signal	I/O PORT (IC11) (1)
<OTHERS>					
BZTN	41	O	Clock Signal		Connector 1 (6) to ANALOG Board
RVN	42	I	ROTATION PULSE Signal	Refer to ICM Tape ROTATION Detector Circuit on P. 159 for details.	Connector 1 (7) from ANALOG Board
$\overline{\text{RESET}}$	24	I	RESET Signal		IC21 (4)
$\overline{\text{WDERR}}$	67	O	Watch Dog Error Signal	Outputs the signal at low and resets the system when the software runs away.	
$\overline{\text{TEST1}}$	25	I	Test Signal		
MITEST	26	I	Test Signal		
$\overline{\text{RTCS}}$	104	O	Clock Chip Select Signal	Clock IC (IC4) Chip Select Signal	Clock IC (IC4) (2)
$\overline{\text{OPRBE}}$	37	O	BUS Buffer Enable Signal		IC9 (19)
LCDE	38	O	LCD Controller Chip Select Signal		Connector 3 (10)
$\overline{\text{RESV1}}$	39	O	I/O PORT Chip Select Signal		IC8 (17)
TDSTB	70	O	Test Signal	NOT USED	
<POWER SUPPLY/ GND>					
V_{CC}	16	I	Power Supply (+5 V)		
	50	I			
	84	I			
	118	I			
GND	17	I	GND		
	51	I			
	85	I			
	119	I			
	128	I			

2-7. I/O PORT (IC11)

The 82C55 is used for the I/O port IC.
The signals such as PAPER SENSOR, DOCUMENT SENSOR, READ POSITION SENSOR are connected to the input port. The CPU (IC1) reads the sensor signals through the I/O port (IC11). The signals such as 24 V thermal head ON/OFF control and CUT MOTOR Control, etc. are connected to the output port controlled by the CPU (IC1).

Block Diagram



2-8. I/O PORT (IC301)

IC301 executes operation panel control by means of the 8 bit×6 I/O port. P00 to PC7, P10 to P17, and P20, P22 work as output ports and control LEDs.
P30 to P37, and P40 to P46 compose the key matrix. Data transmission with the CPU (IC1) is executed via the bus buffer IC9.

Circuit Diagram...Refer to pages 189 and 190.

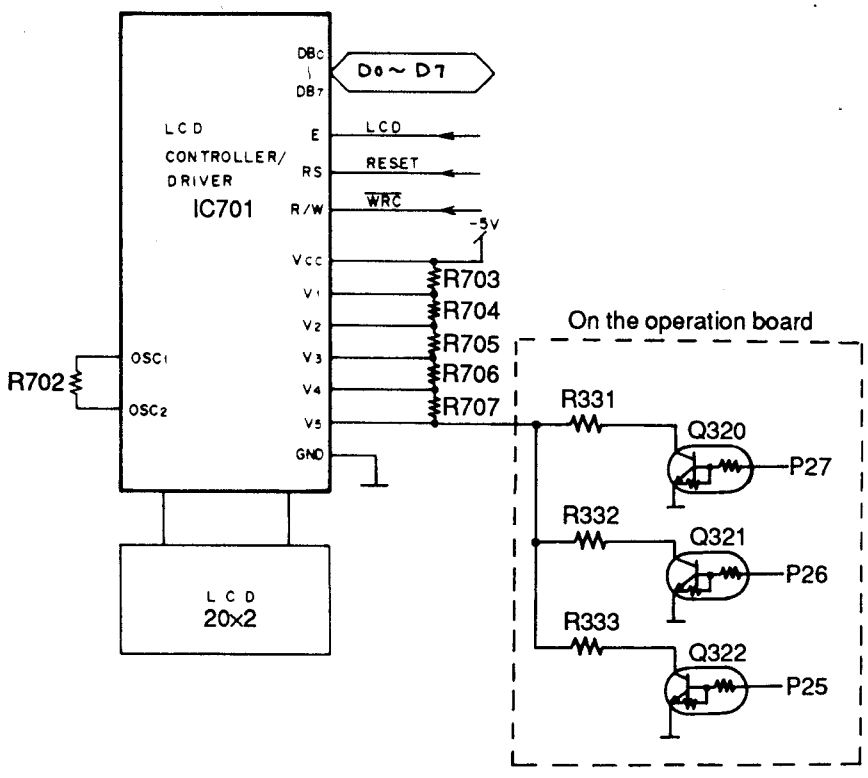
2-9. MODEM (IC5)

This IC facilitates modulation and demodulation for FAX communication. Since it conforms to communication sequences stipulated in CCITT, it can be controlled from the CPU (IC1) by writing in instruction commands with chip select signals $\overline{\text{MDCS}}$ and address buses A1~A5 to the 32 individual resistors in the modem (IC5). Details will be discussed later.

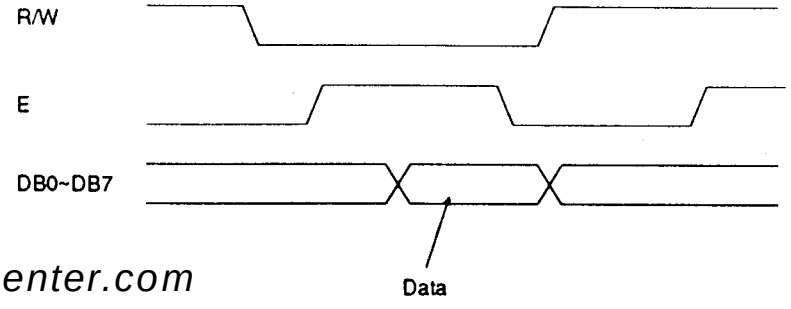
2-10. LCD CONTROLLER (IC701)

This IC is a chip with LCD controller and driver built in. The CPU (IC1) need only write ASCII code from the data bus (D0~D7). V1 through V5 are power supplies for crystal drive. R331, R332, R333 are density control resistors and R702 is an externally applied resistance for internal oscillation circuit. This IC is similar with the 68000 type CPU.
Consequently, for control by Z80, in this set the timing (mainly positive clock) is generated by the LCD interface circuitry of the gate array (IC6).

Circuit Diagram



Timing Chart



Density	Light (3)	Normal (2)	Dark (1)
P27	L	L	H
P26	L	H	H
P25	H	H	H

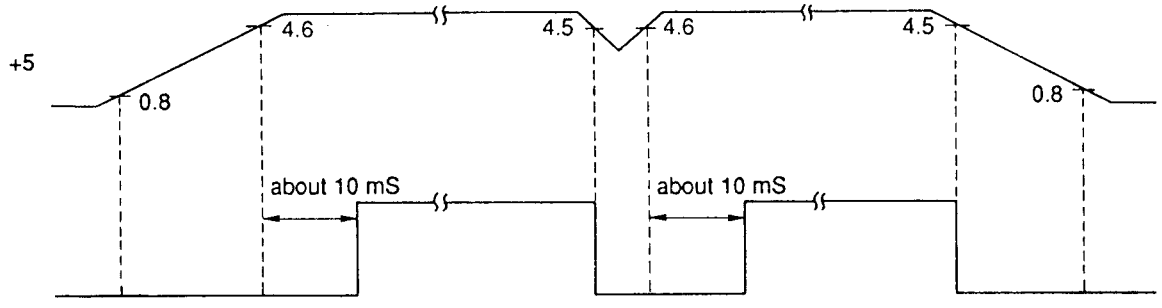
Service Mode
No. 565 (1, 2, 3)

2-11. RESET CIRCUIT

The output from pin 3 of the Reset IC (IC10) resets the CPU (IC1), the gate array (IC6), the modem (IC5), the Port IC (IC11), the Port IC on the analog board and the I/O Port IC (IC301) on the operating board through the IC21.

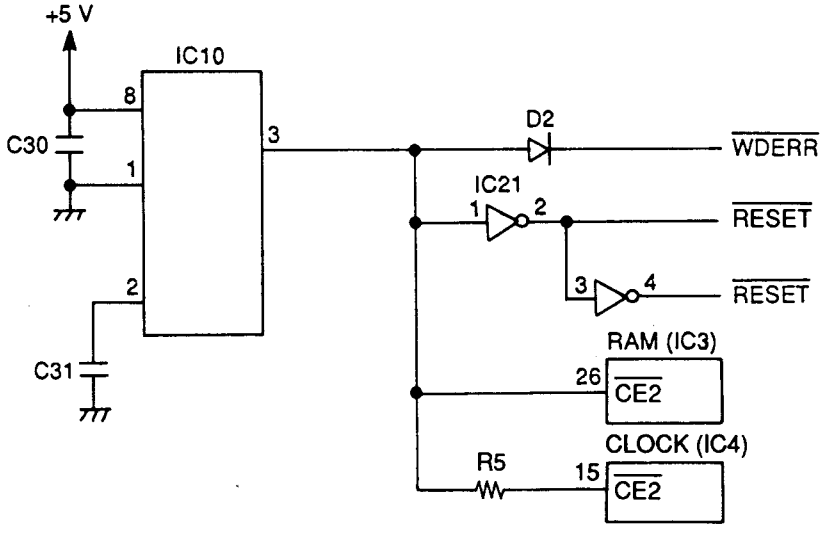
(1) During to momentary power interruption, a positive reset pulse of 10 msec or more is generated and the system is reset completely.
This is done to prevent partial resetting and system runaway during power fluctuation.

Timing Chart



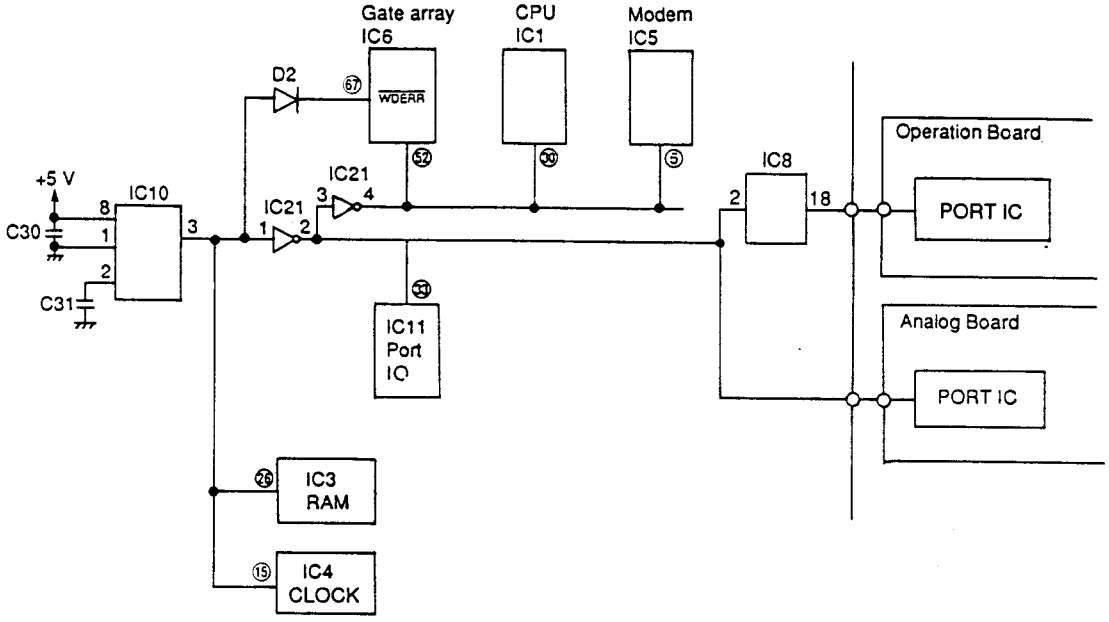
(2) When pin 3 of the IC10 becomes low level to prohibit the RAM (IC3) and Clock (IC4) from changing data.
The RAM (IC3) and Clock (IC4) go into the backup mode, when they are backed up by the lithium battery.

Circuit Diagram



(3) The watch dog timer, built-in the gate array (IC6), is initialized by the CPU (IC1) about every 1.5 ms.
When the watch dog error occurs, pin 67 of the gate array (IC6) becomes low level.
The terminal of $\overline{\text{WDERR}}$ signal is connected to the reset line, so $\overline{\text{WDERR}}$ signal works as the reset signal.

Circuit Diagram



2-12. MEMORY BACKUP CIRCUIT

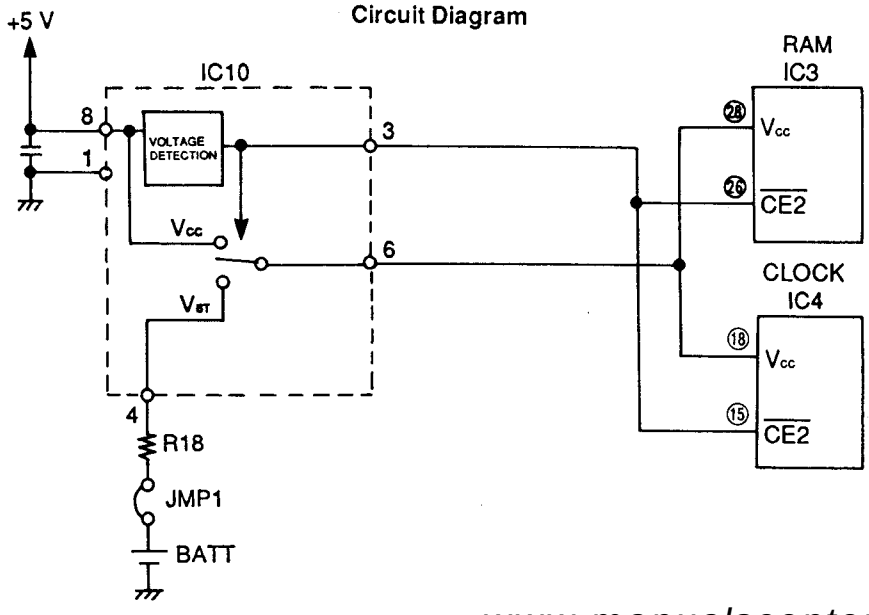
1) Function:

This unit has a lithium battery (BATT), which works for the RAM (IC3) and Clock (IC4) backup.
The user parameter of auto dial numbers, the transmission ID, the system set-up data and so on are stored in the RAM (IC3).

2) Circuit Operation

When the power switch is turned ON, thus supplying the power through the IC10 to the RAM (IC3) and Clock (IC4).
At this time, the voltage at pin 28 of the RAM and pin 18 of the Clock is +5 V.
When the power switch is turned OFF, the BATT supplies the power to the RAM and Clock through the JMP1, R18 and IC10.
At this time, the voltage at pin 28 of the RAM is about +2.5 V.
When the power switch is OFF and the voltage of +5 V goes down, the Reset IC (IC10) outputs the reset signals. Pin 28 of the RAM (IC3) and pin 18 of the Clock (IC4) become low level, then the RAM (IC3) and Clock (IC4) go into the backup mode, when the power consumption is less.

Circuit Diagram

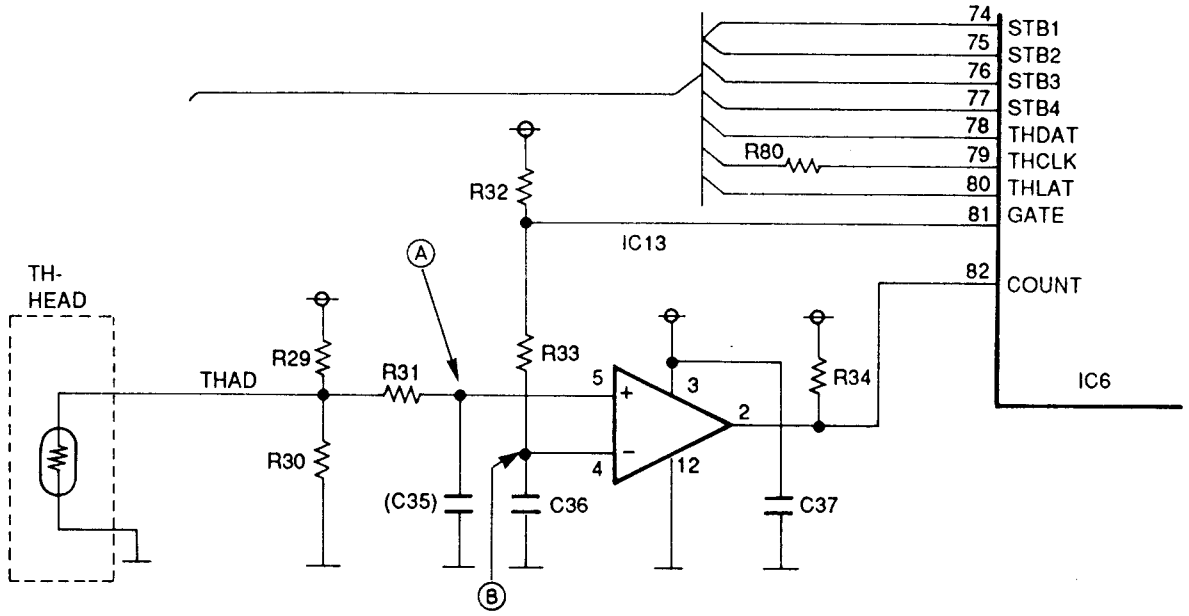


2-13. SUPERVISION CIRCUIT FOR THERMAL HEAD TEMPERATURE

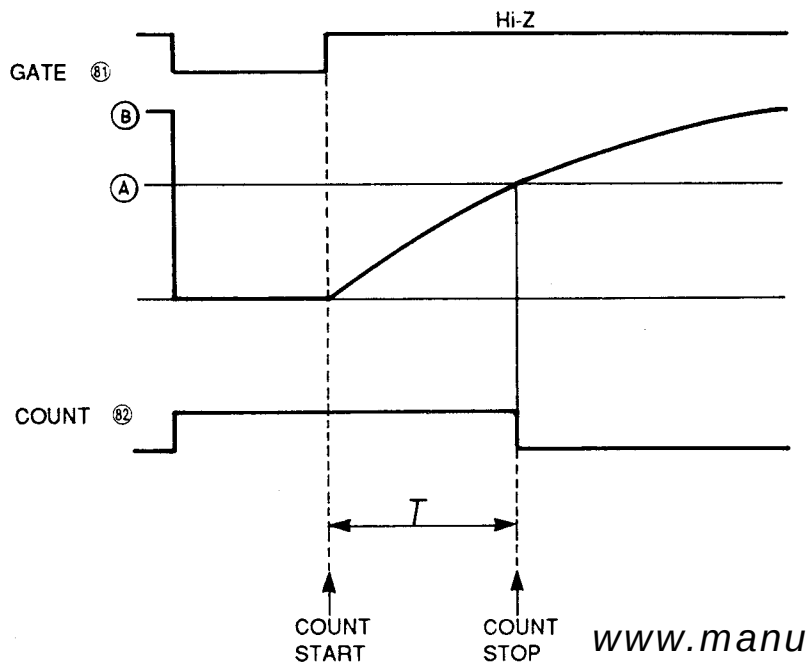
1) Function

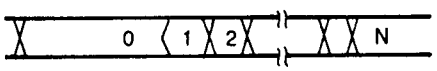
Digitalizes the thermal head temperature by the counter.
The CPU decides the strobe width of the thermal head according to this counted value. Therefore, this circuit can keep the thermal head at an even temperature in order to stabilize the printing density and prevent the head from being overheated.

Circuit diagram



Timing chart



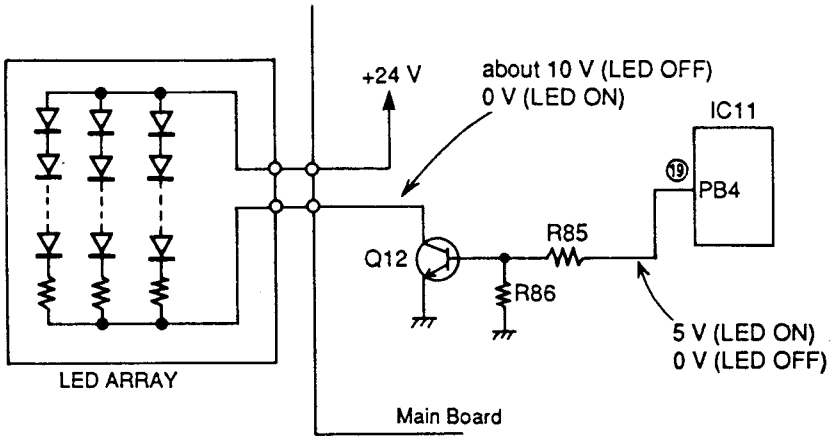


The counter inside IC6 starts operation when GATE is high, and it stops counting when COUNT is low.
Counted value varies with the thermal head temperature.

2-14. LED ARRAY

The LED ARRAY will light during transmission and copying as a light source to recognize document characters, patterns, or graphics on a document.
It is also possible to light the LED ARRAY in the test mode.

Circuit Diagram



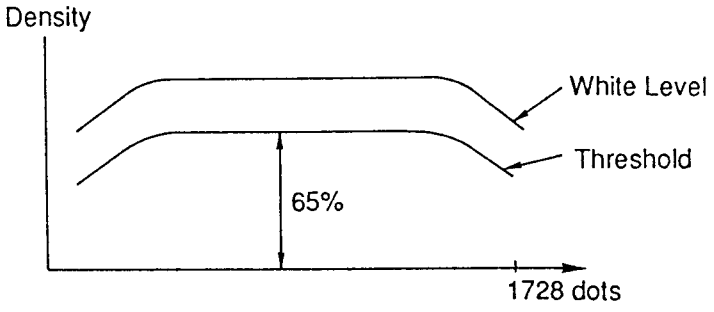
3. FACSIMILE SECTION

3-1. IMAGE DATA FLOW DURING FACSIMILE OPERATION

Copy (Standard, Fine, Super-Fine)

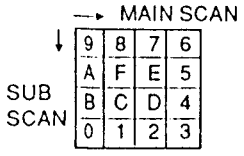
1) One line increment (1728 dots) of white level data is read from the CCD and converted to 64 gradations (6 bit) of density data, for each dot, by the A/D converter (IC12).
2) Shading buffer above RAM (IC7) along route 1 to 2 to 10 to 11 during DMA continuous transmission.
3) Through 12 to 15 to 14 to 11, the 65% level of the white level data stored at SHADING-DATA AREA is calculated at the CPU (IC1) and this value is re-stored at SHADING-DATA AREA. This value determines the threshold level for distinguishing black and white.
4) Actual document is read at CCD input is via A/D converter to the comparator along route 1 to 2 to 3.
   The threshold value calculated in step 3) is input to the comparator along route 12 to 13; these two values are compared, and if the actual document data is higher than the threshold level, white (0) is output; if it is lower, black (1) is output.
5) Black/white data of step 4) is converted to parallel data by serial/parallel converter and during DMA continuous transmission, is stored in image buffer along route 5 to 6.
6) Line increment data stored in image buffers 0 to 7 is sent sequentially to parallel/serial converter along route 7 to 8 during DMA continuous transmission. Here it is converted to serial data, output to the thermal head, and printed on recording paper.

NOTES: Standard; Read 3.85 times/mm
Fine; Read 7.7 times/mm
Super-Fine; Read 15.4 times/mm



(HALF TONE MODE)

1) Same as 1) of standard, fine mode.
2) Same as 2) of standard, fine mode.
3) To create half-tones a dizza pattern is used.
   The meaning of the dizza pattern is shown below.
   It is impossible to change the density of each dot and print it out. Consequently, a 4 X 4 dot matrix is established, and by changing the density (unit number) of black, a printout is obtained which appears to the human eye as half tone.
   This means that the threshold value for distinguishing each dot of the 4 X 4 dot matrix as white or black is changed.
   Consider, for example, the matrix given below.



In this matrix, each dot is assigned a weight and the threshold level is computed by the following formula.

$$Vs = Vw \times \frac{\alpha}{16}$$

Vs : Threshold Level
Vw : White Level
α : Weight

This pattern is called a dizza pattern; it is a numerical weight pattern established statistically.
CPU (IC1) reads out white level data stored in the shading buffer in step 2) along the route: 12 to 15 performs computations, and stores the results in the dizza table on RAM (IC7) along the 14–11 route.

4) Same as 4) of standard, fine mode.
5) Same as 5) of standard, fine mode.
6) Same as 6) of standard, fine mode.
   (Readout Density ... 7.7 time/mm)

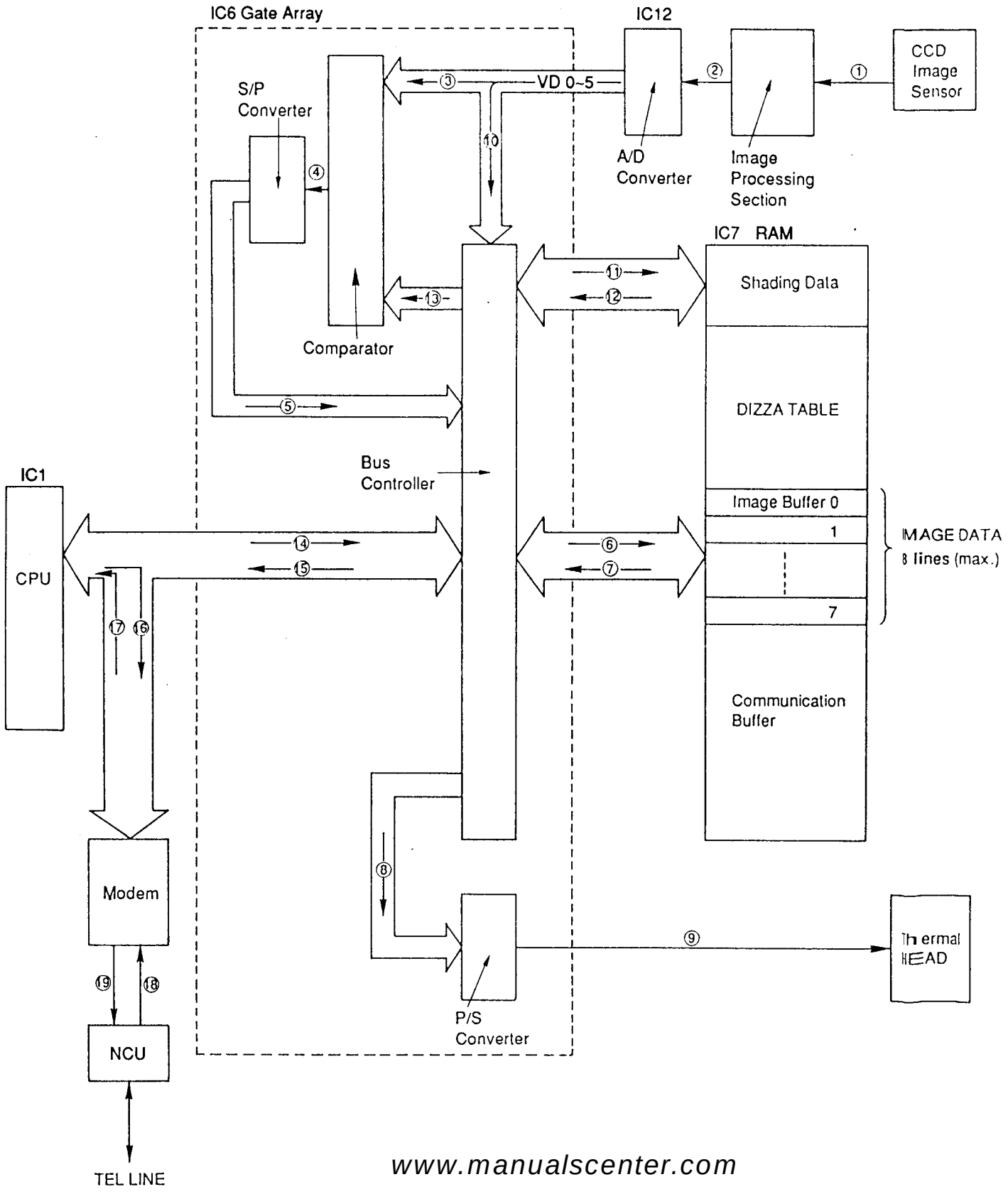
Transmission:

1) Same processing at time of copy (standard, fine mode) 1)-5) and at time of copy (half tone mode).
2) Data stored in image buffer is fetched by CPU (IC1) along route 7 to 15, reduced (Modified Hoffman cording) at table inside ROM (IC2), then stored in communication buffer inside RAM (IC7) along route 14 to 6.
3) While fetching data stored in communication buffer synchronous with modem, CPU (IC1) inputs data to modem along route 7 to 15 to 16, where it is converted to serial analog data and forwarded over telephone lines via NCU Section.

Reception:

1) Serial analog image data is received over telephone lines and input to the modem via NCU section, where it is demodulated to parallel digital data. Then the CPU (IC1) stores the data in the communication buffer of RAM (IC7) along route 17 to 14 to 6.
2) CPU (IC1) fetches data stored in communication buffer along route 7 to 15, restores data to original form inside ROM (IC2), then stores data in image buffer in RAM (IC7) along route 14 to 6.
3) Same processing at time of copy (standard, fine mode) 6).

Block Diagram

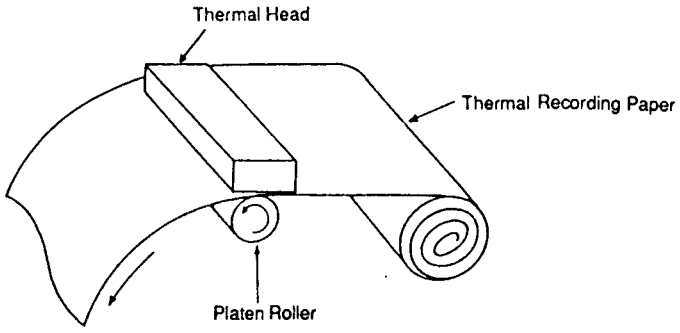


3-2. THERMAL HEAD

1) Function

This unit utilizes state of the art thermal printer technology.
The recording paper (roll paper) is chemically processed. When the thermal head contacts this paper it emits heat momentarily, black dots (appearing almost as a point) are printed on the paper. If this point is continued, letters and/or diagrams appear, and the original document is reproduced.

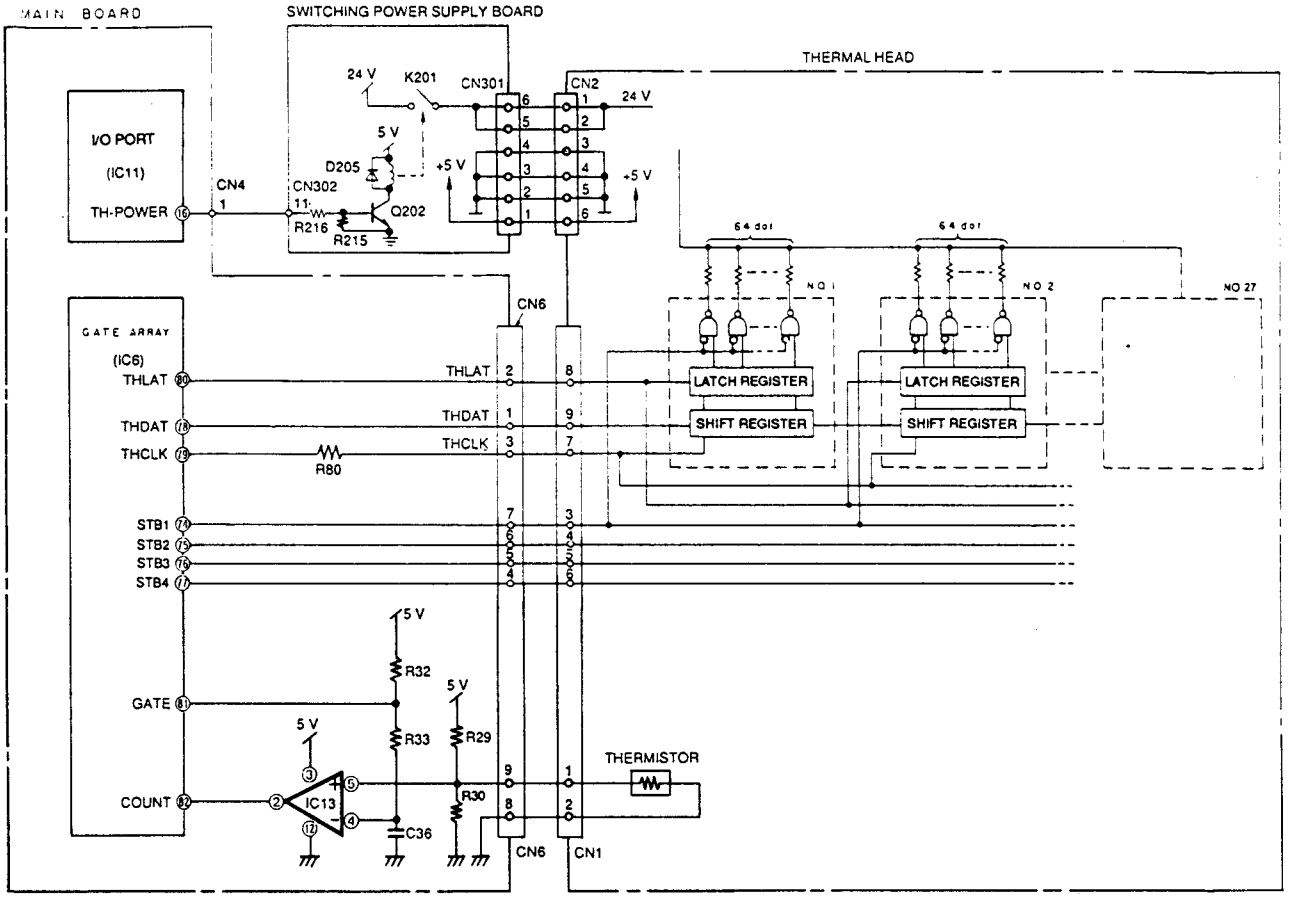
COMPOSITION OF THE RECEIVE RECORD SECTION (THERMAL RECORDING FORMAT)



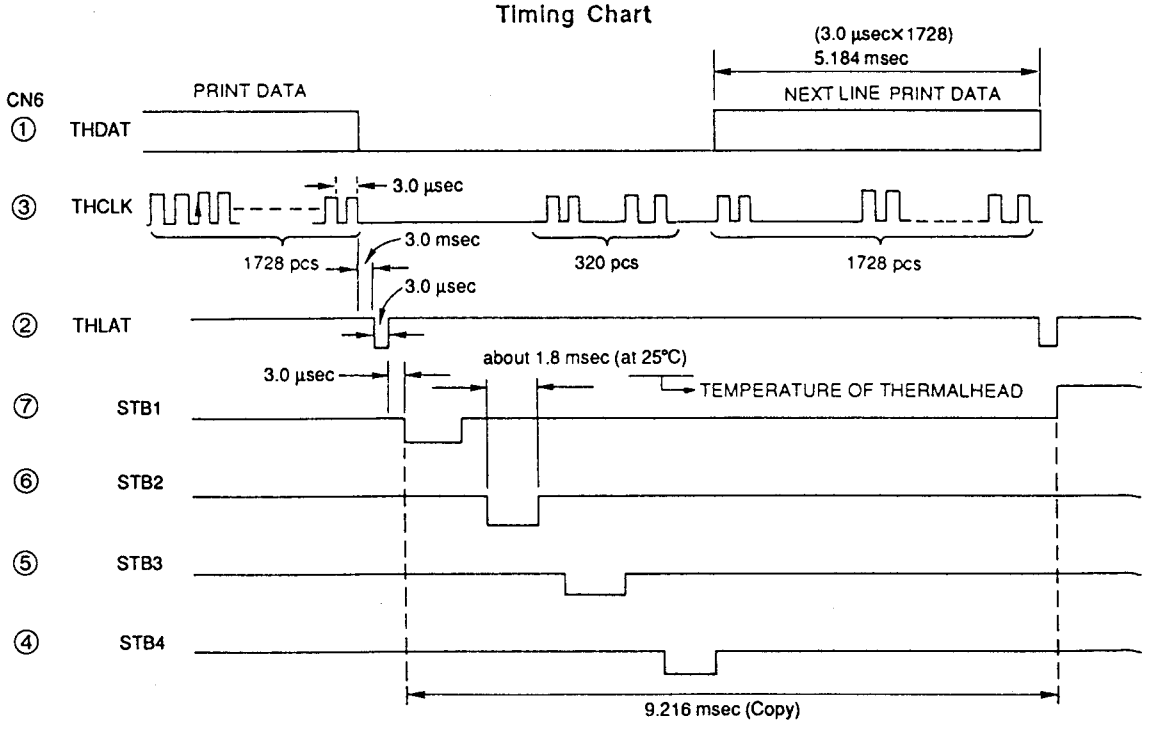
2) Circuit Operation

There are 27 driver ICs aligned horizontally on the thermal head and each one of these ICs can drive 64 heat emitting registers. This means that one line is at a density of 64×27=1728 dots=(8 dots/mm).
White/Black (white=0, black=1) data in one line increments is synchronized at IC6 pin 79 (THCLK) and sent from IC6 pin 78 (THDAT) to the shift register of the ICs. The shift registers of the 27 ICs are connected in series, and upon shift of 1728 dot increment, all the shift register become filled with data, and a latch pulse is emitted to each IC from IC6 pin 80 (THLAT). With this latch pulse, all the contents of shift registers are latched to the latch registers. Thereafter, through the addition of strobe from the IC6 pins (74, 75, 76, 77) only dot of location of black (=1) among latched data activates driver, and current passes to heat emitting body to cause heat emission.
Here the strobe of four lines STB1 to STB4 impresses at intervals of 9.216 msec, as required for one-line printout, for each 1/4th of 27 IC unit (6 unit or 7 unit) upon each time interval divided into four equal increments.
The sequence is as shown below. [Moreover, in the case of strobe width, the resistance value of the thermistor inside the thermal head is constantly detected by the time of IC13 pin 2 level changed High to Low [IC6 pin 82 (COUNT)], and values from the ROM (IC2) table corresponding to temperatures eliminate temperature changes of density through setting by CPU (IC1).]
When the thermal head is not used, the Port IC IC11 (16, TH-POWER) becomes low level, Q202 in the power supply unit becomes OFF, K201 breaks, and the +24 V power supply for the thermal head driver is not impressed to protect the IC.

Circuit Diagram



Timing Chart



3-3. READ SECTION

1) Function

- A document is illuminated by the LED array, and the reflections pass through the reduction-projection lens and are imaged on the CCD image sensor.
- The document image is photoelectrically transferred by the CCD image sensor, and an analog image signal corresponding to one line of the document is continuously output.
- The analog image signal enters the image signal processing circuit and then is converted into a 6-bit digital data.

2) Circuit Operation

[Start]

When the START/COPY button is pressed, IC11 pin 19 goes to a high level and Q12 is turned ON, which makes CN7 pin 2 go to a low level and the voltage applied to the LED array to turn on the LED.
F1, F2, FR and FTG signals are always output to the CCD board to drive the CCD image sensor. Therefore, when the LED is turned ON, the VIDEO (analog image signal) is output from the CCD board to CN5 pin 7.

[Analog Signal Processing]

① Clamp

The VIDEO that entered into the analog signal processing circuit by capacitive coupling is clamped at 0 V by the analog switch (IC17-1/3).
The IC6 pin 14 signal (VIDRST) sets the timing of the clamping operation.

② Sampling

The image signal regenerated as direct current in ① is amplified about two times by the amplifier (IC14-1/2).
The reset noises are removed from the image signal by the sample hold circuit (IC17-2/3, C65 and IC15-1/2), and then the signal is sampled.
The IC6 pin 16 signal (SPH CLK) sets the timing of the sample hold operation.
The processed image signal (IC15-1/2 pin 2) is output to the peak hold circuit (See ④), AGC circuit (See ⑤) reference circuit section (See ⑥) and A/D converter section (See ⑦).

③ CCD Output Compensation

The output voltage during dark transmission (dummy picture element output), is taken as a sample by the sample hold circuit (IC17-2/3, C64, IC14-2/2 and Q7). The IC6 pin 15 signal (DARKON) sets the timing of the sample hold operation. The during picture element is a covered section of the CCD, which will gather charge due to temperature increase.
The Q7 emitter outputs the voltage of dark current period. The output voltage is the standard low level voltage to set the gain in the A/D converter section (See ⑦) so that the output voltage is compensated and canceled the dark current. This removes voltage that is caused by temperature from the CCD output, and leaves only voltage due to light.

④ Peak Hold Circuit

The peak hold circuit consists of IC16-1/2, Q9, C66, R101, C68, R102, Q10, R96, R97, D15, D16, C67 and R98.
(The peak hold level means the level at the "+" side of C68.)
The peak hold circuit is effective only while Q8 is OFF.
The image signal is output from the sampling circuit (See ②) to IC16-1/2 pin 3. IC16-1/2 works so that the image signal reaches the same level as Q9 emitter.
The emitter level is divided by R101 and R102. When the peak hold level is lower than the divided level, C68 is charged by R101 to reach this level. When the peak hold level is higher than the divided level, C68 is discharged by R102 to reach this level.
However, if the peak hold level is lower than a certain level, D15 is turned on to supply the level generated at R96 and R97.
This voltage works so that a document composed only of image signals of low level is read as "black" image signals.
The resultant peak hold level is output through IC15-2/2 to the reference generating circuit (See ⑥).

⑤ AGC Circuit

The AGC circuit consists of Q8 and R94.
When Q8 is OFF, IC16-1/2 supplies the current to R94 and R98 and generates the voltage to drive Q9. As a result, the peak hold circuit (See ④) is effective.
When Q8 is ON, +12 V is supplied through R94 to Q8 and the voltage generated is not enough to drive Q9. As a result, the peak hold circuit (See ④) is ineffective.
In brief, the AGC circuit is for making the peak hold circuit effective at a certain timing.
The control signal (AGCE) is output from IC6 pin 13 to Q8 base.
when the AGCE is at high level, Q8 is turned ON (peak hold circuit is OFF) and when the AGCE is at low level, Q8 is turned OFF (the peak hold circuit is ON).
The low level signal (about 3 ms) and the high level signal (about 7 ms) is alternately output to generate the signal of about 9.216 ms period.

⑤ Reference Generating Circuit

The reference generating circuit consists of R103, R104, C69, R105, IC16-2/2, R106, R108, R109 Q11, R110 and D17.

The level produced in ④ is output from IC15-2/2. This level and the image signal output from IC15-1/2 pin 1 are mixed by R103, R104, R105 and C69 to generate a signal. This signal is amplified by IC16-2/2 to make Q11 a current buffer and is output to Q11 emitter.

This level is used as a high reference level for the A/D converter of IC12.

⑦ A/D Converter Section

The A/D converter of IC12 receives the image signal at pin 15 (analog input), the level generated in ⑥ at pin 14 (high reference) and the output compensation level of dark current period generated in ③ at pin 16 (low reference).

The A/D converter samples the analog input by using the SPHCLK timing (output from IC6 pin 16 and input to IC12 pin 9) and makes A/D conversion to output the 6-bit digital data to IC6 pins 7~12 from IC12 pins 1, 2, 4, 5, 6 and 7.

[Copy]

(Normal and fine mode)

At the beginning of document transmission, a white reference level must be stored.

This is done by reading the standard white board which is attached to the upper cover, before the document is moved into read position. The white reference level is input through IC6, multiplied by a certain number, and stored in the shading RAM of IC7.

This value is the threshold level. Then the document is moved into the read position, and the read data, dot by dot, is compared to the data in the shading RAM.

If the value of the read data is greater than the threshold, the dot is white, if the value level is less, the dot is black.

(Half tone mode)

In the half tone mode, the threshold level is changed, dot by dot, in a either pattern. The either pattern is a four by four black of weighting numbers. (See figure A.)

One weighting value is used for each dot in the scan of a line, and multiplied with the white reference level value for that dot in the shading RAM. This produces the threshold value for the dot, and is compared with the read data as before. The effect of sixteen different thresholds in a four by four pattern produces a "half tone" image when printed on the paper.

$VL = VS \times \frac{\alpha}{16}$

α: Weight
VS: White level
VL: Threshold

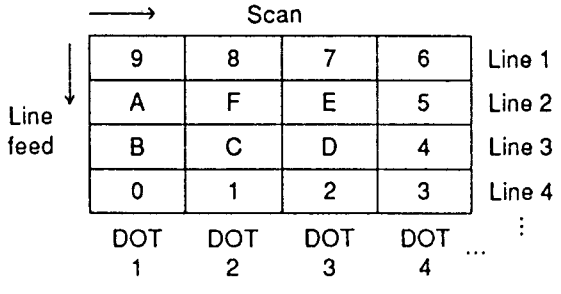
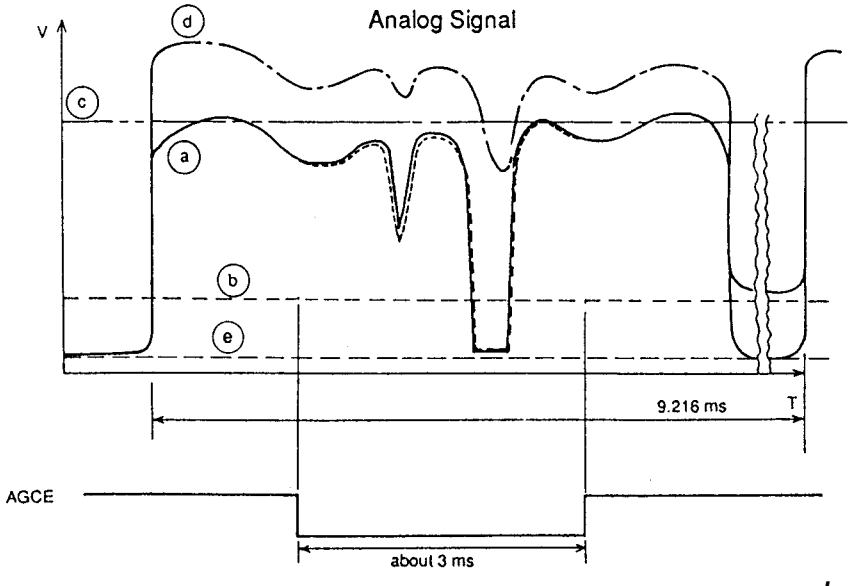


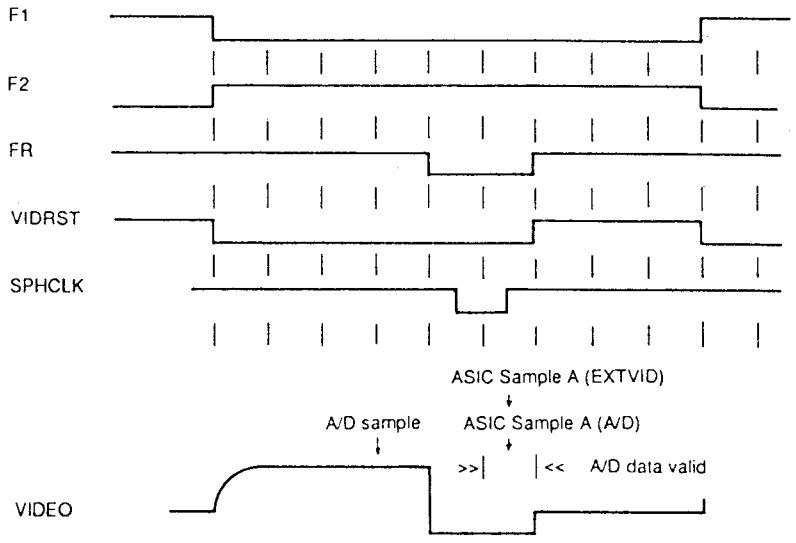
Fig. A

Analog Signal and Digital Signal

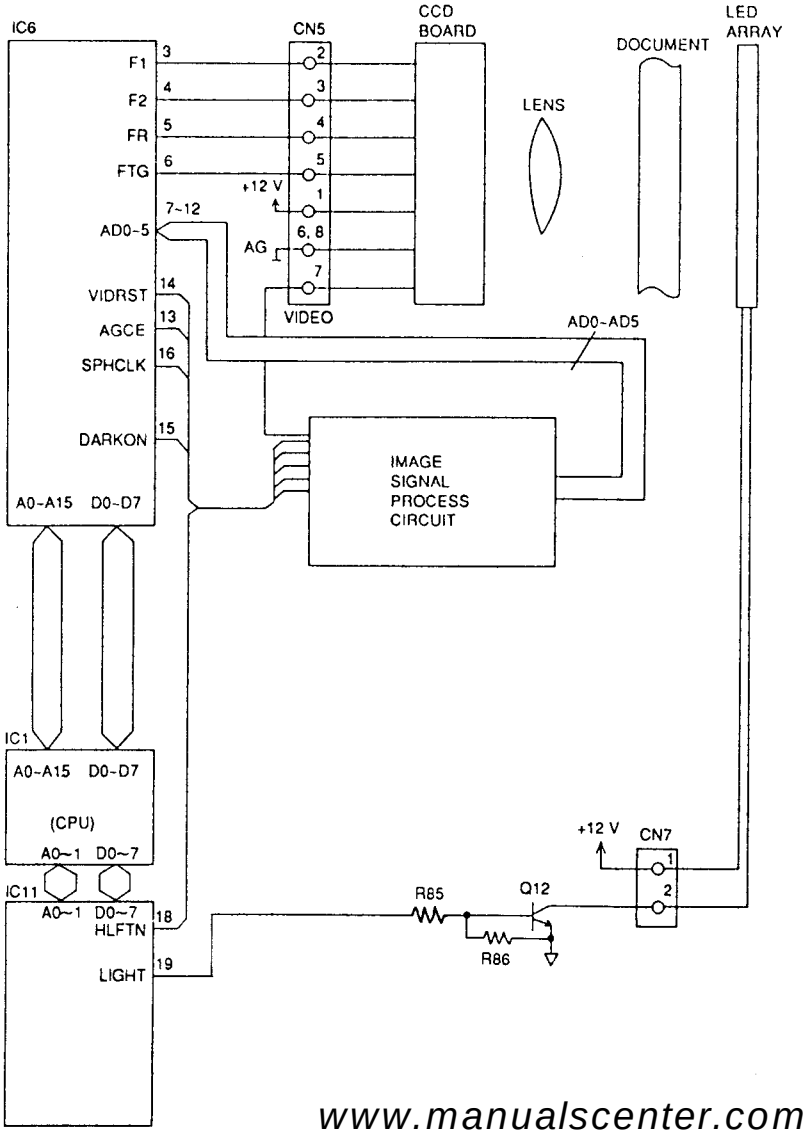


ⓐ IC12 pin 15
ⓑ D15 anode
ⓒ "+" side of C68
ⓓ IC12 pin 14
ⓔ IC12 pin 16

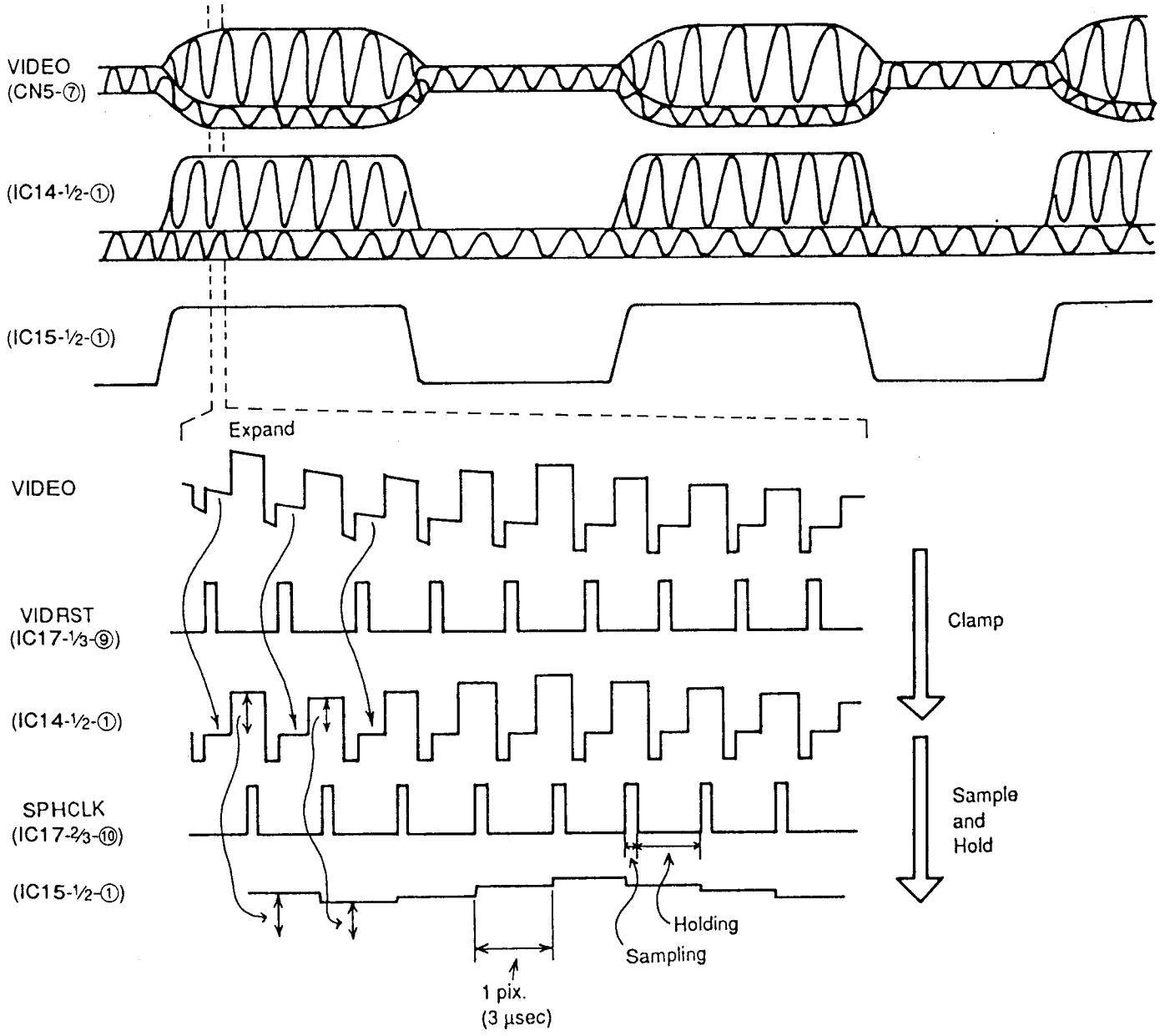
CCD Scanner Timing Chart (1 Dot Cycle)



Block Diagram

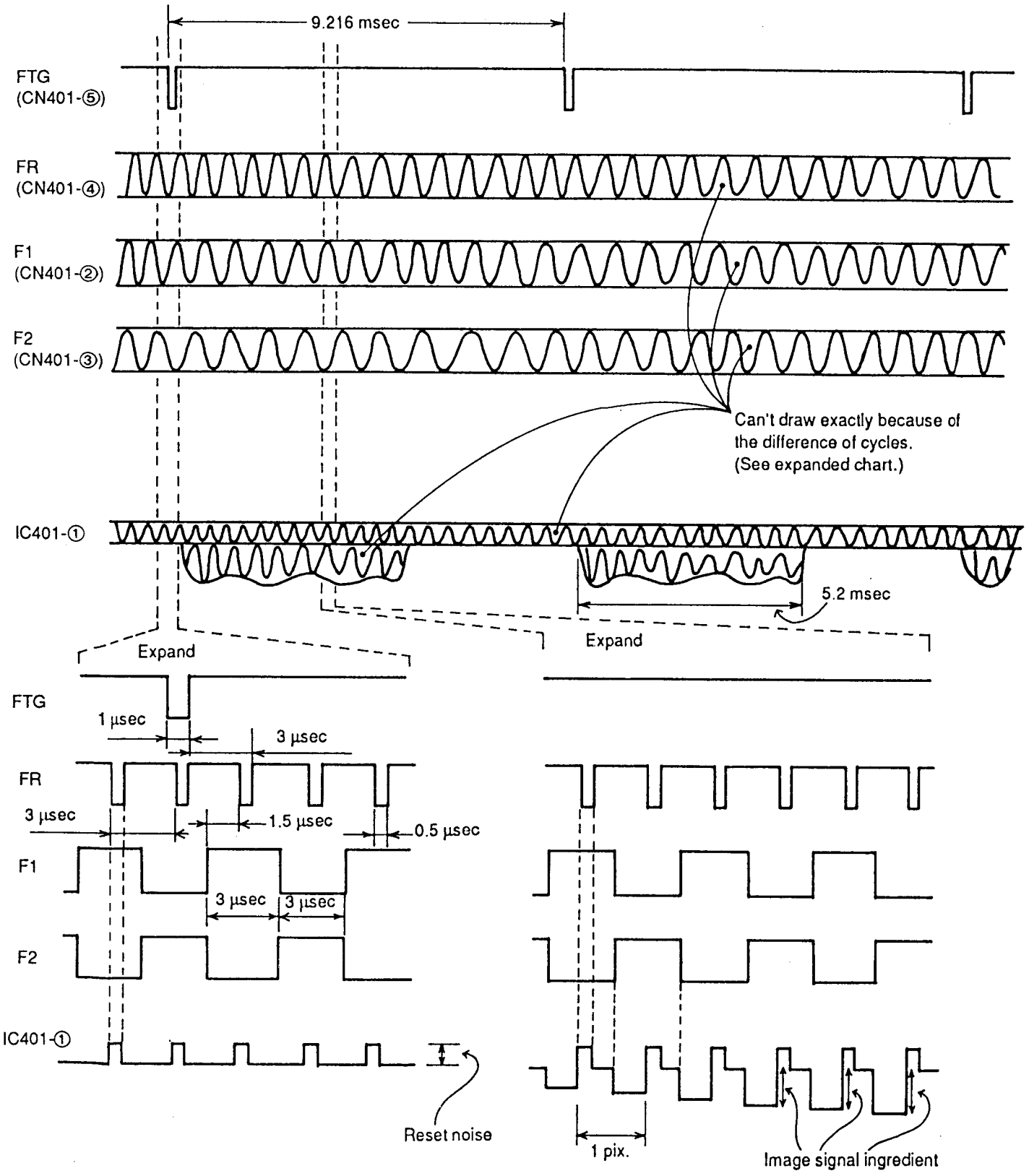


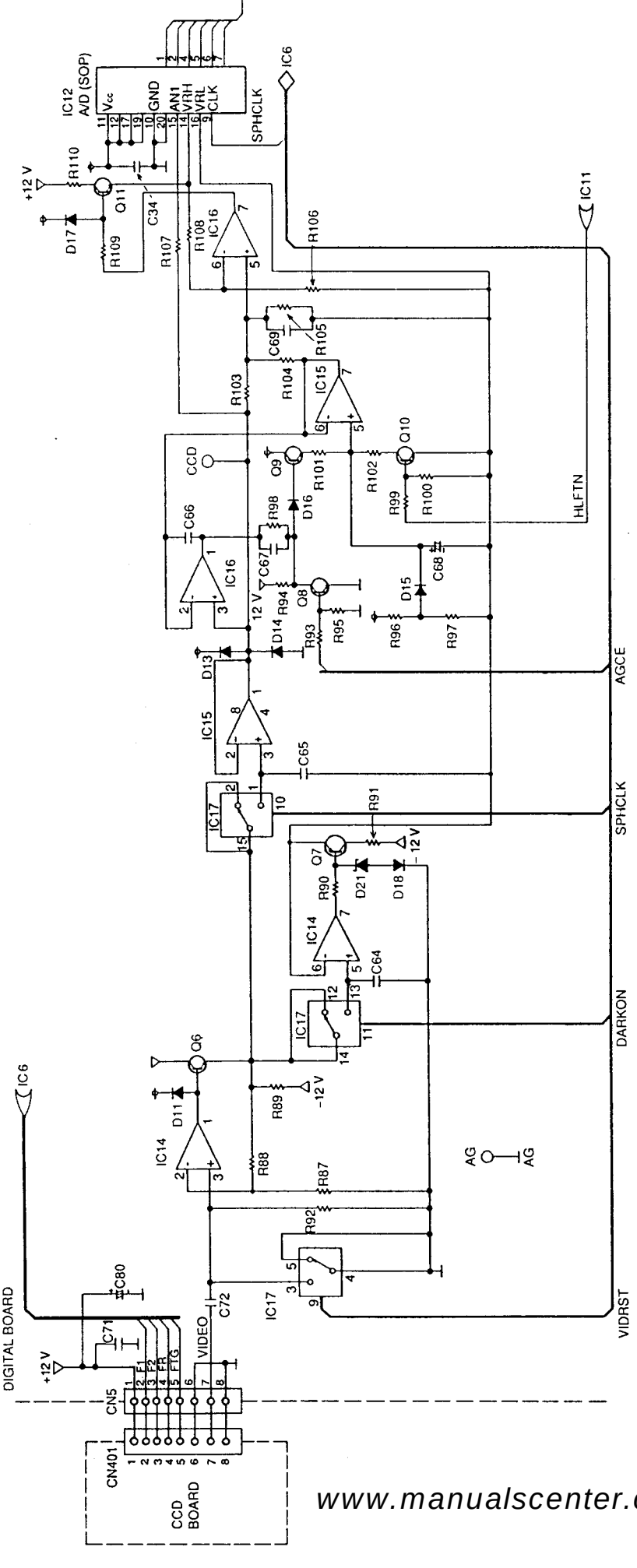
Signal relationships of the clamp and S/H circuit



Clamp: Fix the voltage of some point of an AC coupled signal to object value.
Sample and Hold: Pick out the voltage of some point of a signal, and keep the voltage until next picking out.

Timing chart of CCD board





3-4. STEPPING MOTOR DRIVE CIRCUIT

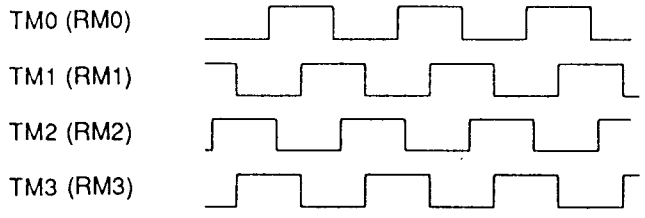
1) Function

Two individual stepping motors are used for transmission and reception. They feed document or recording paper synchronized for reading or printing.

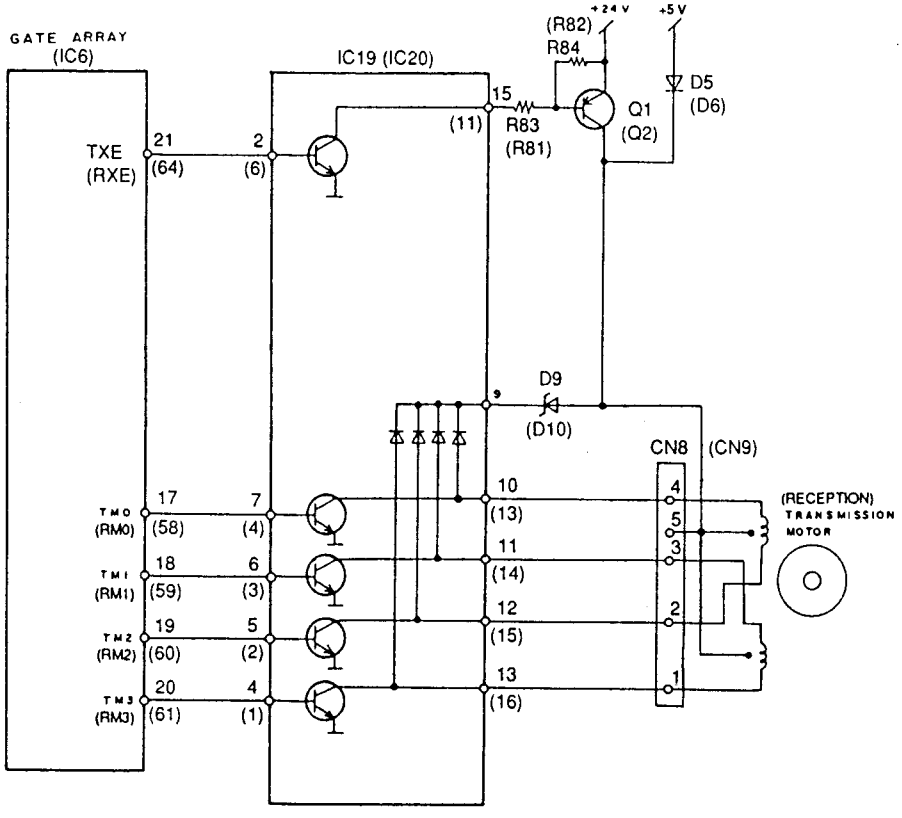
2) Circuit Operation

During motor drive, gate array IC6 pin 21/pin 64 becomes high level, driver IC19/IC20 becomes low level, and Q1/Q2 go ON as a result, +24 V is supplied to the motor coil.
Stepping pulses are output from gate array IC6, causing driver IC19/IC20 to go ON.
The motor coil is energized sequentially in 2 phase increments, which causes a 1-step rotation. Rotation of 1-step feeds 0.13mm of recording paper or document paper.
Timing chart is below.

Timing Chart



Circuit Diagram



When the motor is OFF, gate array IC6 pin 21/pin 64 becomes low level and driver IC19/IC20 becomes high level. This causes Q1/Q2 to also go OFF, and instead of +24 V, +5 V is supplied through D5/D6 so that the motor is held in place.

3-5. DOCUMENT AND RECORDING PAPER FEED MECHANISM SECTION AND SENSOR SECTION

1) Document and Recording Paper Feed Mechanism

[Document Path]

- When the document is aligned in the center, the maximum document width is 218 mm.
- The separation roller (2) and feed rollers (3), (4) are driven by the stepping motor via gears, and rotate in the direction of the arrows as shown in the figure.

The paper feed sequence is described below.

(1) Insert the document along the document insertion guide on the tray. When the documents are placed into position, the document sensor (7) is turned on and a beep will sound so that the user knows the document is properly set.

(2) When the START button is pressed, the motor starts and the rollers start rotating.

(3) One sheet at a time is separated by the separation rubber (6) then sent to the separation roller (2) which rotates and then feeds the document into the unit. (Automated feeding operation)

(4) The read position sensor (8) is turned on when the document is fed.

(5) The document is fed to the CCD start reading position according to the ON data of the read position sensor (8).

(6) When the document reaches the CCD start reading position, the CCD starts reading.

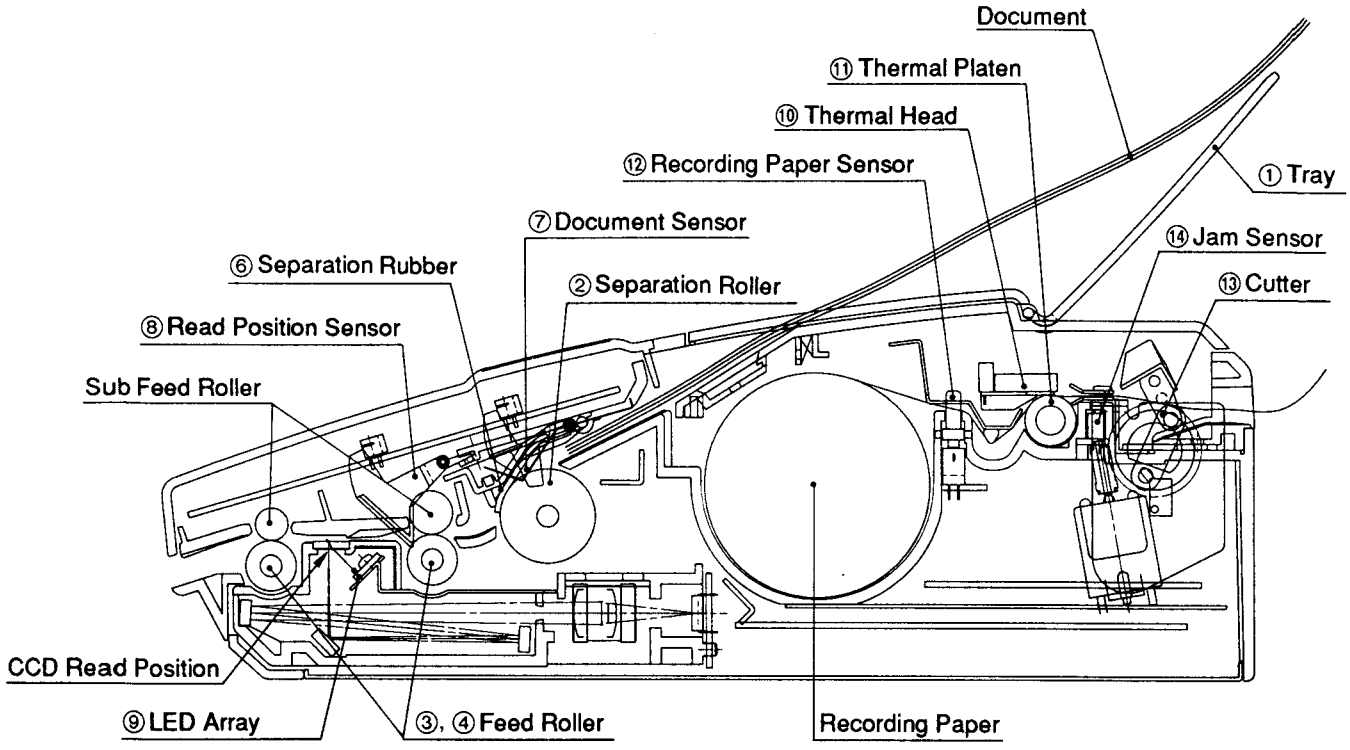
(7) The document is fed when the document feeding and CCD reading are synchronized.

(8) When the document is completely fed and the read position sensor (8) is turned off, the CCD stops reading and the document is discharged by the feed roller (4).

(9) The next sheet separated by the separation roller is fed in.

[Recording Paper Path]

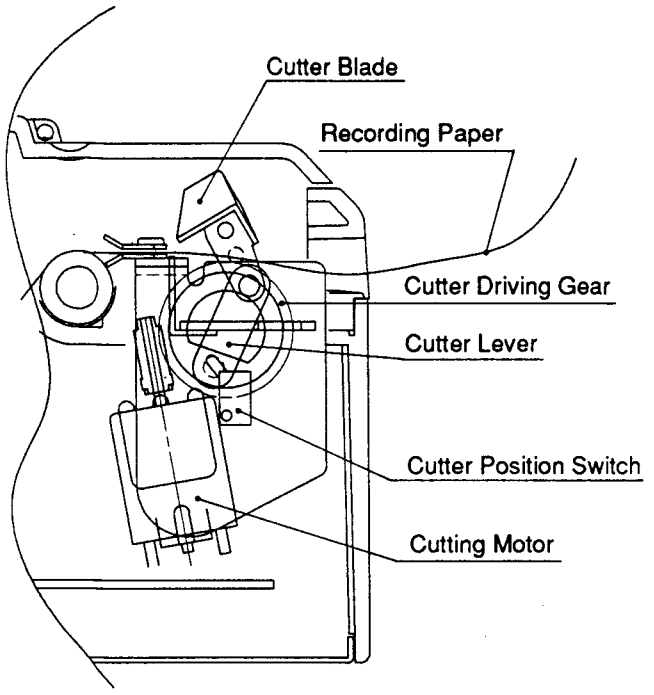
(1) The user inserts the edge of the recording paper into the paper guide for cutter, and close the cover to set the recording paper.
(2) When the cover is closed, the thermal platen (11) starts to rotate, and the recording paper is transported for a fixed distance.
(3) The cutter (13) is driven to cut the recording paper to flush the edge, and the cutter is in the wait status.
(4) When the print command is received, the set transmits the printing signal to the thermal head (10), and it prints on the recording paper.
(5) When printing is completed, the cutter (13) is moved to cut the recording paper.
(6) Paper jam in the cutter unit is detected by the jam sensor (14), and indicated on the LCD.
(7) When the recording paper runs out, the recording paper sensor (12) is turned off so as to warn the user.



[Driving operation of the cutter]

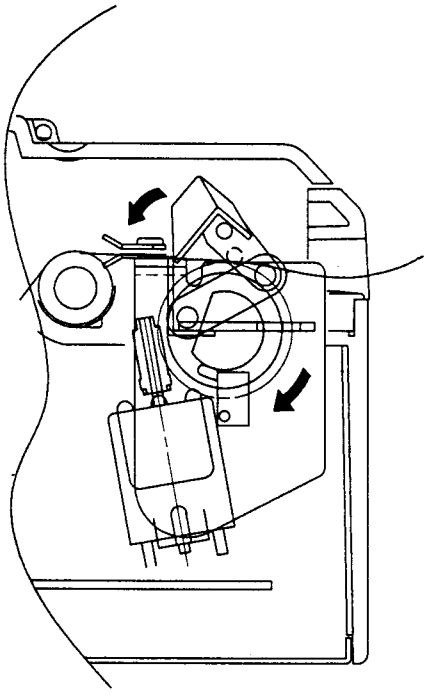
(1) The cutter is in the wait status with the cutter position switch OFF as shown in Fig. 1.
(2) As the cutter driving gear is rotated by the motor, the cutter lever is moved as shown in Fig. 2. At the same time, the cutter blade is lowered simultaneously with the cutter lever, and cutting starts.
(The cutter position switch is ON.)
(3) The cutter driving gear keeps rotating, lowering the cutter blade further. The recording paper is cut accordingly. (Fig. 3)
(The cutter position switch is ON.)
(4) The cutter driving gear keeps rotating, and the cutter blade moves back into the wait status. (Fig. 4)
(The cutter position switch is ON.)
(5) When the cutter position switch is turned OFF, the cutting motor stops and the cutter is in the wait status.
*The cutter repeats the procedures (1) to (5).

Paper Jam:
In order to detect the paper jam in the cutter section, the jam sensor is installed under the paper guide for cutter.
It detects the paper jam according to the position of the reflector-type sensor.



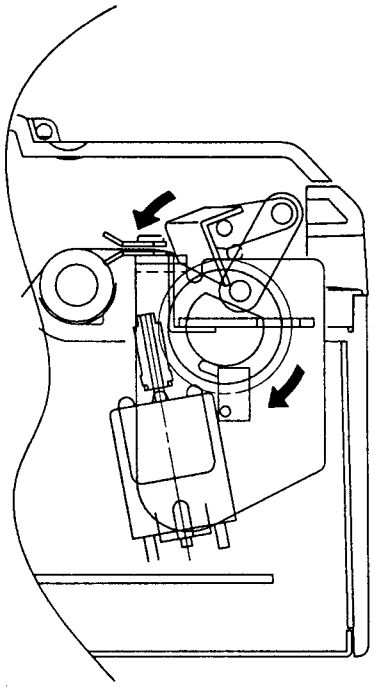
Wait Status

Fig. 1



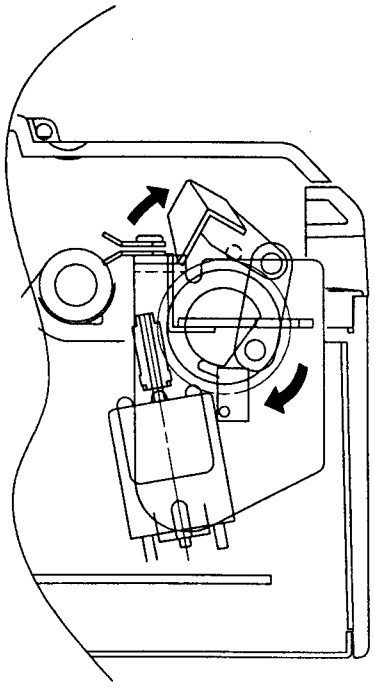
Cutting is going on.

Fig. 2



Cutting is completed.

Fig. 3



Returns to wait status

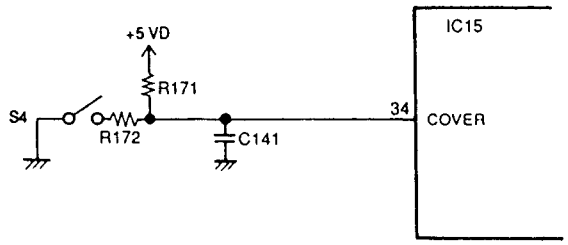
Fig. 4

2) Sensors

[Cover Open Switch (S4)]

When the upper cabinet is closed, the lever of S4 is pushed and the switch becomes OFF.

Circuit Diagram



Analog Board

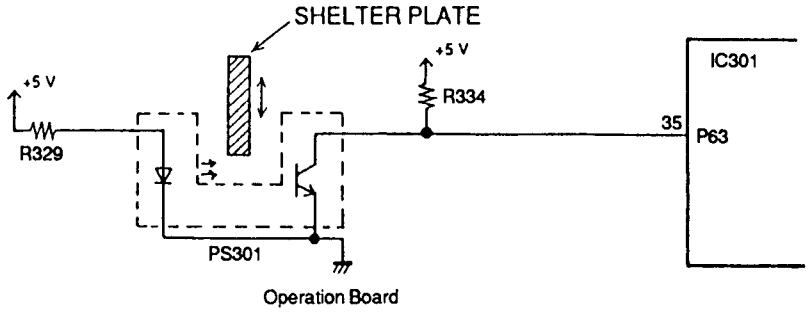
	S4	Signal (IC15–34 pin)
Open	ON	Low Level
Close	OFF	High Level

[Document Sensor (PS301)]

When a document is set, the shelter plate shuts the sensor light, the phototransistor becomes OFF, and the input signal of IC301 pin (35) becomes high level.

When there is no document, the shelter plate passes the sensor light, the phototransistor becomes ON, and the input signal of IC301 pin (35) becomes low level.

Circuit Diagram



Operation Board

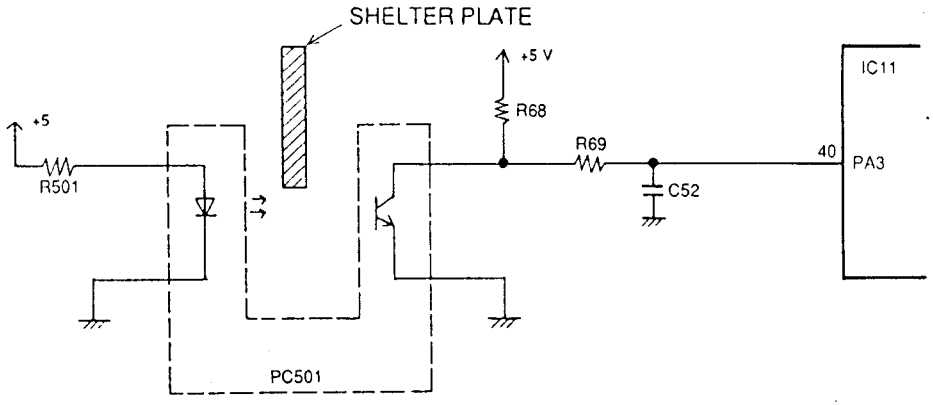
Document	Phototransistor	Signal (IC301–35 pin)
Set Document	OFF	High Level
No Document	ON	Low Level

[Recording Paper Sensor (PC501)]

When recording paper is present, the recording paper pushes against one side of the shelter plate, so that the shelter plate shuts the light. Then the phototransistor becomes OFF and the signal of IC11 pin (40) becomes high level.

When the set runs out of recording paper, the shelter plate no longer will be pushed, so that the spring force brings it to the position where the light is passed. Then the phototransistor becomes ON and the signal of IC11 pin (40) becomes low level.

Circuit Diagram



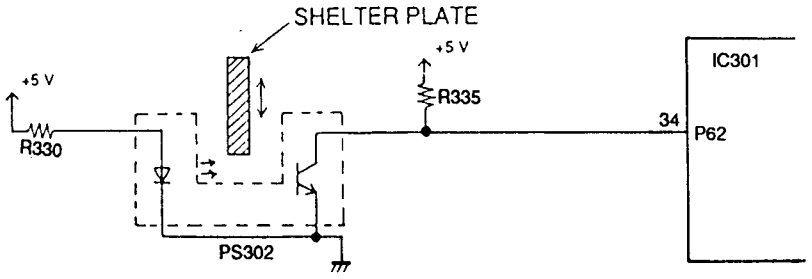
	Light	Phototransistor	Signal
Set Recording Paper	Shut	OFF	High Level
No Recording Paper	Pass	ON	Low Level

[Read Position Sensor (PS302)]

When an document is brought to the read position, the shelter plate shuts the sensor light, the phototransistor becomes OFF, and the input signal of IC301 pin (34) becomes high level.

When there is no document at the read position, the shelter plate passes the sensor light, the phototransistor becomes ON, and the input signal of IC301 pin (34) becomes low level.

Circuit Diagram

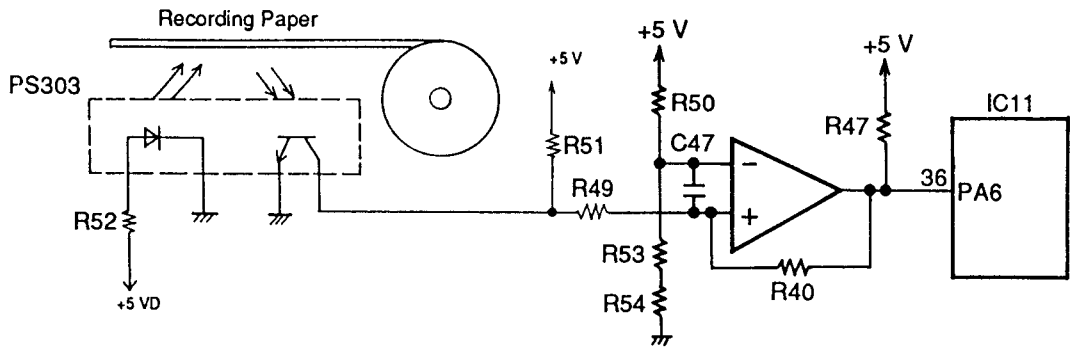


Operation Board

	Light	Phototransistor	Signal (IC11–40pin)
Set Recording Paper	Shut	OFF	High Level
No Recording Paper	Pass	ON	Low Level

[Jam Sensor (PS303)]
A reflector-type photosensor is used. Normally, when the light from the photodiode hits the recording paper and the reflected light enters the phototransistor, the phototransistor becomes ON and the signal of IC11 pin (36) becomes low level.
In case the recording paper does not reach the jam sensor even though it has been fed by some amount, the light from the photodiode does not enter the phototransistor, then the phototransistor becomes OFF and the signal of IC11 pin (36) becomes high level.

Circuit Diagram



	Light	Phototransistor	Signal (IC11-36 pin)
Normal	Reflection	ON	Low Level
Jam	Absorption	OFF	High Level

4. MODEM SECTION

4-1. FUNCTION

The unit uses a 1 chip modem (IC5), enabling it to act as an interface between the control section for FAX sending and receiving, and the telephone line. During a sending operation, the digital image signals are modulated and sent to the telephone line, while during a receiving operation, the analog image signals which are received via the telephone line are demodulated and converted into digital image signals. The communication format and procedures for FAX communication are standardized by CCITT. This 1 chip modem (IC5) has hardware which sends and detects all of the necessary signals for FAX communication.
It can be controlled by writing commands from the CPU (IC1) to the register in the modem (IC5).
This modem (IC5) also sends DTMF signals, generates a call tone (from the speaker), and detects a busy tone and dial tones.

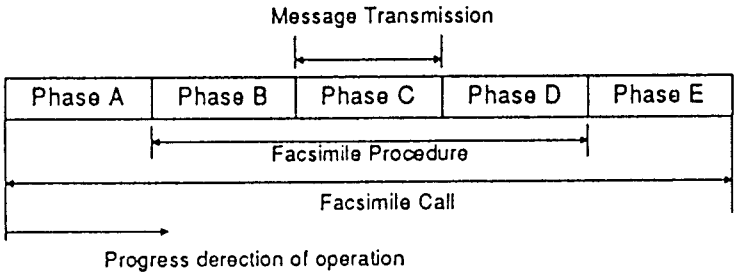
Overview of Facsimile Communication Procedures (CCITT Recommendation):

1) ON CCITT (International Telegraph and Telephone Consultative Committee)
The No. XIV Group of CCITT, one of the four permanent organizations of the International Telecommunications Union (ITU), investigates and make recommendations on international standards for facsimile.

2) Definition of Each Group
- Group I (G1)
A-4 size documents official without using formats which reduce the band width of signals sent over telephone lines.
Determined in 1968.
Transmission for about 6 minutes at scanning line density of 3.85 lines/mm.
- Group II (G2)
Using reduction technology in the modulation/demodulation format, A-4 size document is sent at an official scanning line density of 3.85 lines/mm for about 3 minutes.
Methods to suppress redundancy are not used.
Determined in 1976.
- Group III (G3)
Method of suppressing redundancy in the image signal prior to modulation is used. A-4 size document is sent within about one minute.
Determined in 1980.
- Group N (G4)
Transmission is via data network. Method is provided for suppressing redundancy in signals prior to transmission, and error-free reception of transmission is possible.
The scope of these facsimile applications is not limited simply to transmission of written statements. Through symbiotic linkages with other communications methods, it can be expected to expand to include integrated services.

3) Facsimile Call Time Series

As shown in the following diagram, the facsimile call time series is divided into five phases.



Phase A: Call setting
Call setting can be manual/automatic.
Phase B: Pre-message procedure
Phase B is a pre-processing procedure and a sequence for confirming status of terminal, transmission route, etc. and for terminal control. It implements terminal preparation status, determines and displays terminal constants, confirms synchronization status, etc. and prepares for transmission of facsimile messages.
Phase C: Message transmission
Phase C is the procedure for transmission of facsimile messages.
Phase D: Post message procedure
Phase D is the procedure for confirming that the message is completed and received. In the case of continuous transmission, return is made repeatedly to phase B or phase C for transmission.
Phase E: Call retrieval
Phase E is the procedure for call retrieval, that is, for circuit disconnection.

4) Concerning Transmission of Time

Transmission Time = Control Time + Image Transmission Time + Hold Time

Transmission time consists of the following.

Control time: This is time at the start of transmission when functions at the sending and receiving sides are confirmed, transmission mode is established, and transmission and reception are synchronized.

Image transmission time: This is the time required for transmission of document contents (image data). in general, this time is recorded in the catalog, etc.

Hold time: This is the time required after the document contents have been sent to confirm that the document was in fact sent, and to check for telephone reservations and/or the existence of continuous transmission.

5) Facsimile Standard

Item	Telephone Network Facimile G3 Machine
Connection Control Mode	Telephone Network Signal Mode
Terminal Control Mode	T.30 Binary
Facsimile Signal Format	Digital
Modulation Mode	PSK (V.27 ter) or QAM (V.29)
Transmission Speed	300 bps (Control Signal) 2400, 4800, 7200, 9600 bps (FAX Signal)
Redundancy Compression Process (Coding Mode)	1 dimension : MH Mode 2 dimension : MR Mode (K=2.4)
Resolution	Main Scan : 8 pel/mm Sub Scan : 3.85, 7.7l/mm
Line Synchronization Signal	EOL Signal
1 Line Transmission Time [ms/line]	Depends on degree of data reduction. Minimum Value : 10, 20 Can be recognized in 40ms.

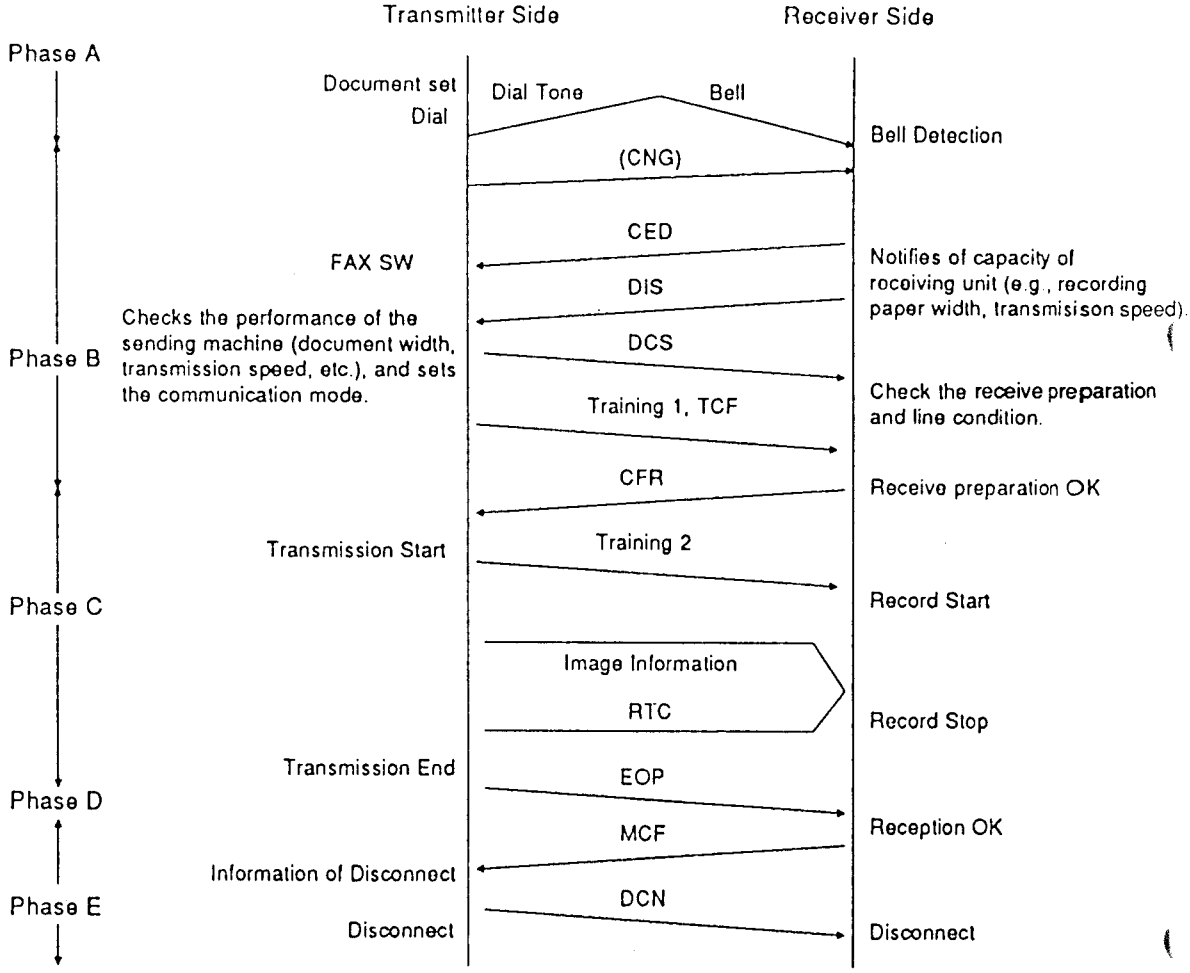
6) Explanation of Termindogy

(1) G3 Communication Signals (T. 30 Binary Process)

In G3 facsimile communication, this is the procedure for exchange of control signals between the sending and receiving machines both before and after transception of image signals.

Control signals at 300 bps FSK are: 1850Hz ... 0, 1650Hz ... 1.

An example of binary process in G3 communication is shown below.



Explanation of Signals

Control signals are comprised mainly of 8-bit identification signals and the data signals added to them. Data signals are added to DIS and DCS signals.

Signal .....DIS (Digital Identification Signal)

Identification Signal Format 00000001

Function:
Notifies of capacity of receiving unit.
The added data signals are as follows.

(Example)

Bit No.	Function	Standard Setting DIS	Remarks
1 ~ 8	Not Used (Fixed)	0	
9	Transmission Function (T4)	0	
10	Reception Function (T4)	1	
11	Modulation Mode and	×	11 12 0 1 4800~2400b/s 1 1 9600~2400b/s
12	Data Speed	1	
13~14	Not Used (fixed)	0	
15	Sub. Scan Line Density 7.7 L/mm	1	0: 3.85 L/mm 1: 3.85, 7.7 L/mm
16	Two-dimensional Coding Function	0	0: MH 1: MH, MR
17	Max. Paper Width: B4	0	
18	Max. Paper width: A3	0	
19	Max. Paper Length: B4	0	
20	Paper Length Unlimited	1	
21	1 Line Min. Scan Time	×	21 22 23 1 1 0 20msec (3.85 line/mm)
22		×	
23		×	10msec (7.7 line/mm)
24	Extension Field	1	
25~32	Not Used (Fixed)	0	

Signal ..... DCS (Digital Command Signal)

Identification Signal Format X1000001

Function:
Notifies of capacity of receiving machine obtained at DIS and announces the transmission mode of the sender.
The added data signals are as follows.

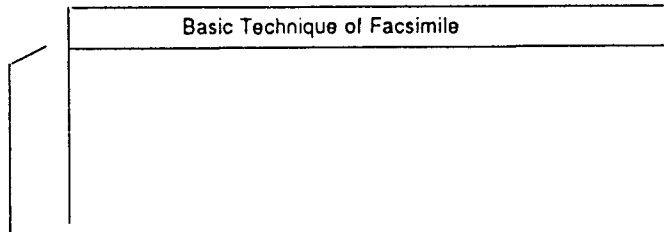
(Example)

Bit No.	Function	Standard Setting DIS	Remarks
1 ~ 8	Not Used (Fixed)	0	
9		0	
10	Reception Command (T4)	1	
11	Modulation Mode and	×	11 12 0 0 2400b/s V27ter 0 1 4800b/s V27ter 1 0 9600b/s V29 1 1 7200b/s V29
12	Data Speed	×	
13~14	Not Used (fixed)	0	
15	Sub. Scan Line Density 7.7 L/mm	×	1 : 7.7 L/mm 0 : 3.85 L/mm
16	Two-dimensional Coding Function	0	
17	Max. Paper Width: B4	0	
18	Max. Paper width: A3	0	
19	Max. Paper Length: B4	0	
20	Paper Length Unlimited	×	Reception Unlimited: 1
21	1 Line Min. Scan Time	0	21 22 23 0 0 1 20msec 0 0 0 40msec 0 1 1 10msec 1 0 1 5msec 1 1 1 0msec
22		×	
23		×	
24	Extension Field	1	
25~32	Not Used (Fixed)	0	

Signal	Identification Signal Format	Function
Training 1	———	Fixed pattern is transmitted to receiving side at speed (2400 to 9600 bps) designated by DCS, and the receiving side optimizes the automatic equalizer, etc., according to this signal.
TCF (Training Check)	———	Sends 0 continuously for 1.5 seconds at the same speed as the training signal.
CFR (Confirmation to Receive)	X0100001	Notifies sending side that TCF has been properly received. If TCF is not properly received, FTT (Failure To Train) X0100010 is relayed to sender. Sender then reduces transmission speed by one stage and initiates training once again.
Training 2	———	Used for reconfirmation of receiving side the same as training 1.
Image Signal	Refer to next page.	———
RTC (Return to Control)	———	Sends 12 bit (0 ... 01 x 6 times to receiver at same speed as image signal and notifies of completion of transmission of first sheet.
EOP (End of Procedure)	X1110100	End of one communication
MCF (Message Confirmation)	X0110001	End of 1 page reception
DCN (Disconnect)	X1011111	Phase E starts.
MPS (Multi-Page Signal)	X1110010	Completion of transmission of 1 page. If there are still more documents to be sent, they are output instead of EOP. After MCF reception, sender transmits image signal of second sheet.
PRI-EOP (Procedural Interrupt-EOP)	X1111100	If there is an operator call from the sender, it is output after RTC.
PIP (Procedural Interrupt Positive)	X0110101	Output in the case of operator call from receiver.

2) Redundancy Compression Process Coding Mode
This set uses one-dimensional MH format.

(a) Document



(b) Part of document

(c) Run length and image signals equivalent to (b)

(d) Codification of (c) according to MH formula

00110111101010 (White 400)	011 (Black 4)	110101 (White 15)	11 (Black 2)	001000 (White 12)	011 (Black 4)	101010 (White 16)

11 (Black 2)	0100111 (White 18)	000101 (Black 8)	000011 (White 13)	10 (Black 3)

(c) Total bit number before MH codification (497 bit)
(d) Total bit number after MH codification (63 bit)

Modified Huffman (MH) Code		
Run length	Code for White Line	Code for Black Line
0	00110101	000011011
1	000111	010
2	0111	11
3	1000	10
4	1011	011
5	1100	0011
6	1110	0010
7	1111	00011
8	10011	000101
9	10100	000100
10	00111	0000100
11	01000	0000101
12	001000	0000111
13	000011	00000100
14	110100	00000111
15	110101	000011000
16	101010	0000010111
17	101011	0000011000
18	0100111	0000001000

4-2. MODEM CIRCUIT OPERATION

The modem (IC5) has all the hardware satisfying the CCITT standards mentioned previously.
When the gate array IC6 (73) is brought to low level, the modem (IC5) is chip-selected and resistors inside IC are selected by select signals from CPU (IC1) A0–A4, commands are written through data bus, and all processing is controlled at the CPU (IC1) according to CCITT procedures. Here the signal $\overline{INT}$ dispatched from $\overline{IRQ}$ (pin 58 of IC5) to the CPU (IC1) and gate array IC6 is output when preparation for acceptance of transmission data is OK and when demodulation of reception data is complete; the CPU (IC1) implements post processing.
This modem (IC5) has an automatic application equalizer. With training signal 1 or 2 at time of G3 reception, it can automatically establish the optimum equalizer. With CABLE1 and CABLE2, the equalizer in the modem (IC5) can be set up from outside. When the distance to the station is long or transception does not occur properly, correction of 0.0 km, 1.8 km, 3.6 km and 7.2 km is possible with user setting.
Also, the modem (IC5) generates an internal clock of 24.00014 MHz by means of an external crystal oscillator (X1).

1) Facsimile Transmission/DTMF Line Send
The digital image data on the data bus is modulated in the modem (IC5), and sent from pin 28 via amplifier IC18 (2→1), the NCU section to the telephone line.

IC5 (28)→R10→IC18 (2) (1)→C69→R65→NCU Section [IC10 (3) (4)→R40→C21→IC13 (6) (7)→R32→T1]→ TEL. Line

2) Facsimile Reception
The analog image data which is received from the telephone line passes through the NCU section and enters pin 37 of the modem (IC5). The signals that enter pin 37 of the modem (IC5) are demodulated in the board to digital image signals, then placed on the data bus.
In this case, the image signals from the telephone line are transmitted serially, Hence they are placed on the bus in 8 bit units. Here, internal the equalizer circuit reduces the image signals to the long-distance receiving level.
It is designed to correct the characteristics of the frequency band centered about 3 kHz and maintain a constant receiving sensitivity. It can be set in the service mode.
TEL. Line→NCU Section [T1→R31→C16→IC4 (6) (7)→IC10 (14) (13)]→C68→R13→IC18 (6) (7)→R14→IC5 (37)

3) DTMF Transmission (Monitor tone) and Line send Beep (for ATAS)
The DTMF signal generated in the modem (IC5) is output from pin 28, then passes through the analog switch IC10 pins (3-4), and the NCU section to the telephone line as same as facsimile transmission signals.
During monitor operation, the monitor tone is output from the analog switch IC10 pins (1-2) through speech network IC1 pins (7-9) and the ATAS IC11 pins (6-3) power amplifier to the speaker.

(Beep Line Send)
IC5 (28)→R10→IC18 (2) (1)→C62→IC9 (3) (4)→C58→R68→NCU Section [IC10 (5) (4)→R40→C21→IC13 (6) (7)→ R32→TEL. Line

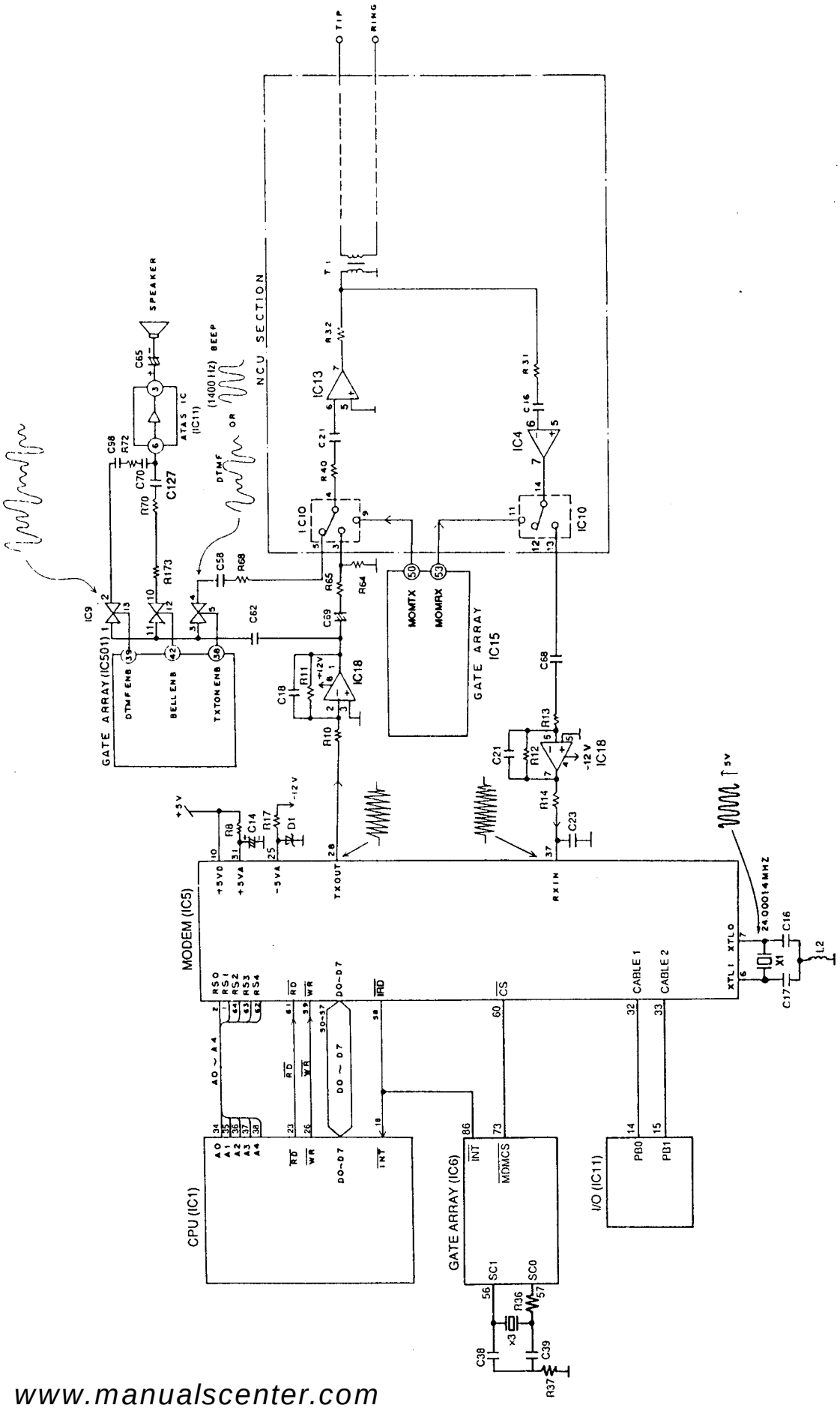
(DTMF Monitor Tone)
IC5 (28)→R10→IC18 (2) (1)→C62→IC9 (1) (2)→C98→IC11 (6) (3)→C65→Speaker

4) Call Tone Transmission
The call signal which is generated in the modem (IC5) passes through analog switch IC10 (11-10) and ATAS IC11 (6-3) to the speaker.

IC5 (28)→R10→IC18 (2) (1)→C62→IC9 (11) (10)→C127→IC11 (6) (3)→C65→Speaker

5) Busy/Dial Tone Detection
The path is the same as for FAX receiving. When it is detected, the carrier detect bit of the resistor in the modem (IC5) becomes 1, and this status is monitored by the CPU (IC1).

Circuit Diagram



5. EXPLANATION OF ANALOG SECTION BLOCK DIAGRAM

1) Function

The analog section serves as interface with the telephone line. The digital board (IC5) for transmission and reception of FAX signals, the DTMF receiver (IC3) for remote signal detection, and the special ATAS IC (IC11) for general management of the ATAS operation are connected to the NCU section. Switching between the digital board (IC5) and the other sections is executed by means of a multiplexer in the NCU section. The control signals to the individual analog sections are output mainly from the gate array IC15, and the status information for the various sections also is held in the gate array IC15. Simple explanations for the various sections are given below.

2) Circuit Operation

[NCU Section]

Interface with the telephone line. This is composed of bell detection circuit, CPC detection circuit, pulse dial generation circuit, amplifier circuit for line transmission and reception, sidetone circuit, multiplexer circuit, etc. See below for details.

[DTMF Receiver IC (IC3)]

This permits remote operation from the line and External telephone. See below for details.

[ATAS Special IC (IC11)]

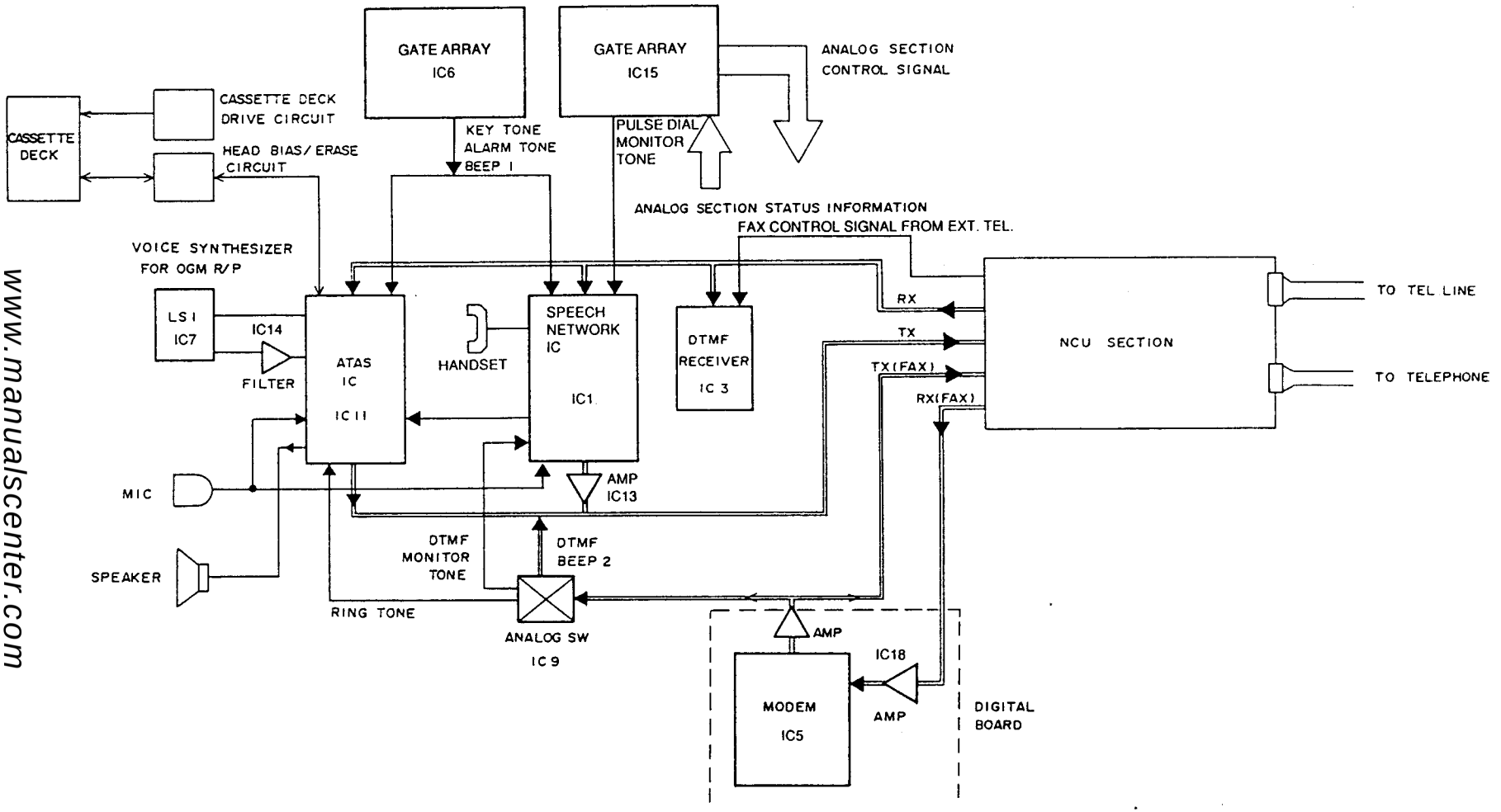
This is a special IC for general management of the ATAS operation.
The voice synthesizer LSI (IC7) for OGM recording and playback, the bias circuit for cassette deck recording and playback, the microphone, and the speaker are connected to this IC.
The key tone, the ATAS beep (Beep 1), and the alarm tone generated by digital board (CN1) are output to the speaker via the built-in power amplifier.

[Modem (IC5)]

This is used for FAX signal tone modulation, DTMF signal transmission, ring tone generation, and line transmission beep (Beep 2) generation. The DTMF signal and Beep 2 are placed onto the TX system via the analog switch IC9.
The ring tone also passes through the analog switch IC9.
It is given as input to the special ATAS IC (IC11), and it is output to the speaker via the built-in power amplifier.

[Speech Network IC (IC1)]

This is a special IC combining the hands-free and handset circuits in 1 chip. The handset and microphone are connected to this circuit. At the time of hands-free operation, the SP output is output after passage through the power amplifier in the special ATAS IC (IC11), and the key tone and the pulse dial monitor tone output from IC6 and IC15 are given as input to this IC and become the monitor tone at the time of hands-free and handset pulse dialing.



6. NCU SECTION

6-1. GENERAL

This section is the interface with the telephone line, and it is composed of EXT. TEL Line relay (RLY1), bell detection circuit, pulse dial circuit, CPC detection circuit, line amplifier and sidetone circuits and multiplexer.

6-2. EXT. TEL. LINE RELAY (RLY 1)

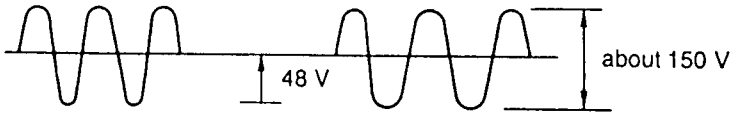
1) Circuit Operation
Normally this relay switches to the external telephone side (break) and it switches to the open side (make) when the set starts facsimile communication.

IC15 (45) High Level→Q6 ON→RLY 1 (make)

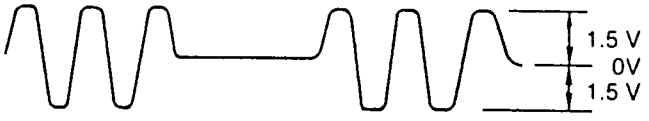
6-3. BELL DETECTION CIRCUIT

1) Circuit Operation
Signal waveform of each section are indicated below. Signal (low level section) input to pin 46 of gate array IC15 are read out at CPU and judged as bell.

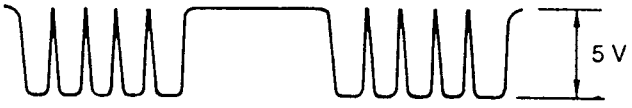
Between Tip and Ring



Between PC1(1) and (2)



PC1 (4)/Gate Array IC15 (46)



T1→L1→R1→PC1 (1→2)→C1→L2→R

6-4. PULSE DIAL CIRCUIT

1) Circuit Operation
In OFF-HOOK Condition, the photocoupler PC4 pin (2) is low level by IC15 pin (4) and PC4 pin (4) is low level so Q1 is ON.
At the time of pulse dial operation, PC4 pin (2) becomes high level by IC15 pin (40), so that PC4 pin (4) becomes high level, and Q1 becomes OFF line ON/OFF by high/low control for IC15 pin (4) makes pulse dial operation possible.

IC15 (4) High Level→PC4 (2) High Level→PC4 (4) High Level→Q1 OFF→Telephone Line

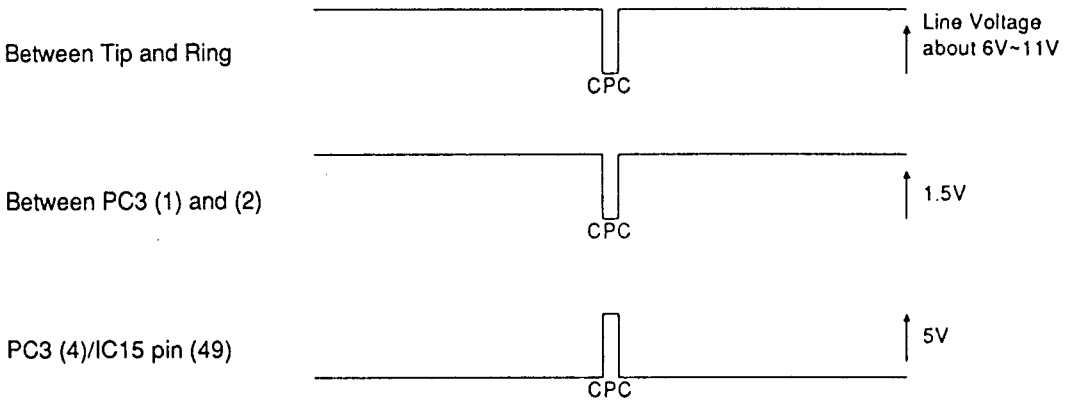
6-5. AUTO DISCONNECT CIRCUIT

Function:
This circuit is used to detect the fact that another telephone connected to the same line is OFF-Hook while the unit is in ATAS operation.

Circuit Operation:
Tip (Ring)→D30→Q1→C50/C155→D2→R53→Q2→PC2.
During this interval C50/IC155 charges and the base of Q2 becomes high, and PC2 pin (2) becomes low, causing PC2 to go ON.
If a parallel-connected telephone or external telephone is put into an OFF-HOOK status, charge ceases to flow C50/C155, and the base of Q2 becomes low, causing PC2 to go OFF.
When a line is connected, Q2 and PC2 go ON, causing pin 48 of IC15 to go low. When the line is disconnected, Q2 and PC2 go off, causing pin 48 of IC15 to go high.

6-6. CPC DETECTION CIRCUIT

1) Circuit Operation
For detection of temporary line disconnection during on line condition, CPC detection is executed after DC loop formation as shown in the figure.
As the line voltage always is applied between (1) and (2) of photocoupler PC3 during DC loop formation, PC3 (4) always is low level. PC3 (4) and IC15 pin (49) momentarily become high level by line disconnection.



As the CPC signal time differs according to the exchange, selection is possible by key input.

	A	B
OK	more than 8 msec	more than 600 msec
NG	less than 5 msec	less than 350 msec

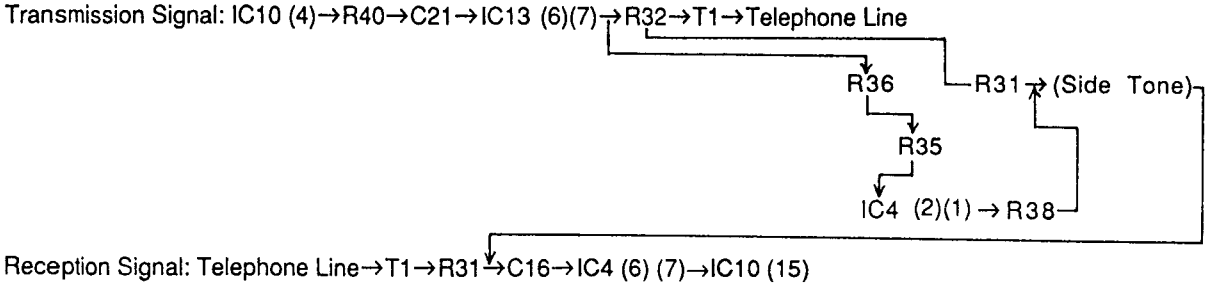
2) The Signal Path
T→L1→D30→Q1→R102→Q3→R145→PC3 (1→2)→D30→L2→R

6-7. LINE AMPLIFIER AND SIDE TONE CIRCUITS

1) Circuit Operation

The reception signal received as output from the line transformer T1 is given as input to R31, C16 to IC4 pin (6), and it is input to the reception system at an amplifier gain of 3 dB from pin 1.

The transmission signal given as input to IC13 pin (6) via R40, C21 is amplified to about 23 dB, it is output from pin 7 of IC13, and it is transmitted to the via R32, T1. Without IC4 pins (2) (1), the transmission signal here would return completely to the reception amplifier via R31. Here, the signal output from IC13 pin (7) passes through R36, R35 and enters the reversion amplifier IC4 pin (2), a signal with the reverse phase of the transmission signal is formed at IC4 pin (1), and this is used to cancel the return part of the transmission signal. This is the side tone circuit.



6-8. MULTIPLEXER (IC10)

This multiplexer is used for switching and selecting the transmission and reception system of the FAX circuit (modem) and the transmission and reception system of the ATAS/ITS circuit.

	Control	Switch Mode
ATAS/ITS Operation	TEL=High (pin 10) MODEMRX=Low (pin 11) MODEMTX=Low (pin 9)	Y-Y1 ON (pins 15-1) X-X0 ON (pins 14-12) Z-Z0 ON (pins 4-5)
FAX Operation	TEL=Low (pin 10) MODEMRX=High (pin 11) MODEMTX=High (pin 9)	Y-Y0 ON (pins 15-2) X-X1 ON (pins 14-13)
Dialing Operation	TEL=High (pin 10) MODEMRX=High (pin 11) MODEMTX=Low (pin 9)	Y-Y1 ON (pins 15-1) X-X1 ON (pins 14-13)

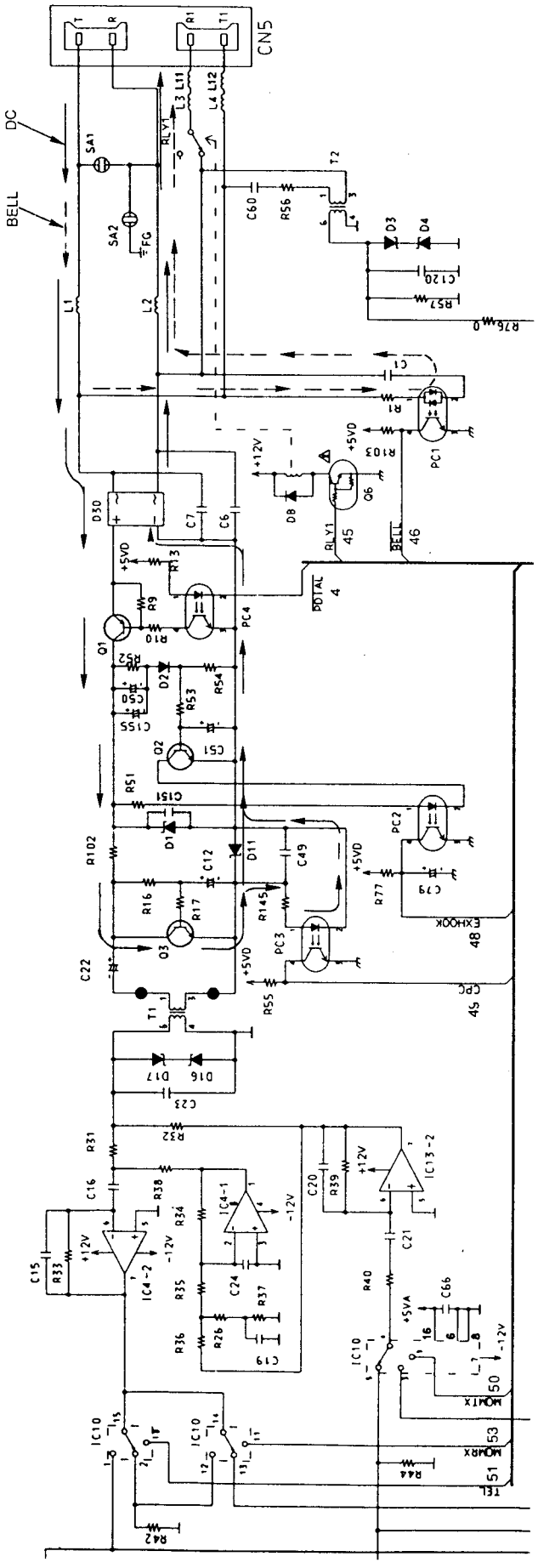
Note:
As the modem executes tone detection the time of dialing, the ATAS/ITS circuit and the modem are connected to the reception system, i.e. MODEMRX=high level because of TEL=high level.

Control Mode for NCU Section Table

	Control Input to NCU					Control Output from NCU		
	RLY1 (make) RLY 1	Q1 (OFF) PDIAL	IC10 (15)-(1) ON TEL	IC10 (14)-(13) ON MODEMRX	IC10 (4)-(3) ON MODEMTX	BELL	CPC	EX HOOK
Wait Condition	0	1	1	0	0	---	---	---
During the Bell Input	0	1	1	0	0	1/0	---	---
During the FAX Communication	1	0	1	0	1	---	----	---
During the ATAS/ITS Off-Hook	0	0	1	0	0	---	---	---
During the Pulse Dial	0	0/1	1	0	0	---	---	---
During the Tone Dial	0	0	1	0	1	---	---	---
CPC Input	0	0	1	0	0	---	0→1	---
External TEL Off-Hook of During the Off-Hook	---	---	---	---	---	---	---	0→1→0
External TEL On-Hook of During the On-Hook	---	---	---	---	---	---	---	---

1: High Level (5V) 0: Low Level

Circuit Diagram



7. ITS (Integrated Telephone System) AND MONITOR SECTIONS

7-1. GENERAL

The general ITS operation is executed by the special IC1. This IC has a speakerphone circuit and a handset circuit in 1 chip, and control to each mode is executed from the outside (IC15). At the time of speakerphone operation, the speaker output passes through the power amplifier of the special ATAS IC (IC11). The DTMF signal, the line transmission beep (Beep 2), and the bell tone are output from the modem (IC5) and distributed by the analog switch (IC11). The D-RAM tone, the key tone, and the ATAS beep (Beep 1) are output from the gate array IC6. At the time of pulse dial operation, the monitor tone is output from the gate array IC15.

7-2. SPEAKERPHONE CIRCUIT

1) Function

This circuit controls the automatic switching of the transmitted and received signals, to and from the telephone line, when the unit is used in the hands-free mode.

2) Circuit Operation

The speakerphone can only provide a one-way communication path.
In other words, it can either transmit an outgoing signal or receive an incoming signal at a given time, but cannot do both simultaneously. Therefore, a switching circuit is necessary to control the flow of the outgoing and incoming signals. This switching circuit is contained in IC1 and consists of voice detector, TX attenuator, RX attenuator, comparator, and attenuator control. The circuit analyzes whether the TX(transmit) or the RX(receiver) signal is louder, and then it processes the signals such that the louder signal is given precedence.
The voice detector provides a DC input to the attenuator control corresponding to the TX signal. The comparator receives a TX and RX signals, and supplies a DC input to the attenuator control corresponding to the RX signal.
The attenuator control provides a control signal to the TX and the RX attenuator to switch the appropriate signals ON and OFF. The attenuator control also detects the level of the volume control to automatically adjust for changing ambient conditions.

(Transmission Signal Path)

The input signal from the microphone is sent through the circuit via the following path:
MIC→R82→C132→IC1 [(15)→MIC AMP→SW4→TX ATT→(27)]→R43→C44→R46→R47→IC13 (2) (1)→C47→R50→NCU Section [IC10 (5) (4)]→Telephone Line

(Reception Signal Path)

Signals received from the telephone line are outputted at the speaker via the following path:
Telephone Line→NCU Section [IC10 (15) (1)→C48→R41→IC1 [(23)→SW3→RX ATT→(1)]→C40→IC1 [(7)→SW5→SP AMP→(9)]→R80→C135 →IC11 [(6)→Power AMP→(3)] →C65→Speaker

(Control Signal Path)

Control signals for transmission and reception are inputted to IC1 via following path:
(Transmission Control Signal Path)
MIC→R82→C132→IC1 [(15)→MIC AMP→SW4→(2)]→C34→R28→IC1 [(4)→AMP→Comparator]
(Reception Control Signal Path)
Telephone Line→NCU Section [IC10 (15) (1)→C48→R41→IC1 [(23)→SW3→RX ATT→(1)]→C40→IC1 [(7)→SW5→SP AMP→(9)]→C37/C38→R29→IC1 [(6)→AMP→Comparator]

(Voice Detector)

The transmission signal given as input from the microphone to IC1 pin (4) passes through the built-in amplifier and enters the voice detection circuit for judgment of voice noise. In case of noise, the TX attenuator is made effective via the attenuator control.

(Attenuator Control)

The attenuator control detects the setting of the volume control through pin 3 of IC1 to automatically adjust for changing ambient conditions.

7-3. HANDSET CIRCUIT

1) Transmission Signal

Handset MIC→C11→R5→IC2 (2) (1)→C18→R83→IC1 (26)→Handset MIC AMP→SW1→C42→R45→R47→IC13 (2) (1)→C47→R50→NCU Section [IC10 (5) (4)]→TEL LINE

2) Reception Signal

TEL LINE→NCU Section [IC10 (15) (1)]→C48→R41→IC1 [(23)→SW2→Handset SP AMP→(20)]→Handset Speaker

7-4. MONITOR CIRCUIT

1) DTMF Monitor
(Speaker operation)
CN1 (9)→C62→IC9 (1) (2)→C98→R72→C70→[IC1 (7)→SP AMP→(9)]→R80→C135→IC11 [(6)→POWER AMP→(3)]→C65→Speaker

(Handset operation)
CN1 (9)→C62→IC9 (1) (2)→C98→R70→C57→IC1 [(22)→Handset SP AMP→(20) (21)]→Handset Speaker

2) DTMF Signal for Line Transmission
CN1 (9)→C69→R65→NCU [IC10 (3) (4)]→TEL. Line

3) Beep Tone (1388 Hz)
CN1 (9)→C62→IC9 (3) (4)→C58→R68→NCU [IC10 (5) (4)]→TEL. Line

4) Bell Signal
CN1 (9)→C62→IC9 (11) (10)→R173 → R73→C127→IC11 (6)→ POWER AMP→C65→Speaker
Low
→IC9(9)(8)
High

5) Key tone (1389 Hz)
(Speaker operation)
CN1 (6)→R200→R199→C10→IC11 [(6)→POWER AMP→(3)]→C65→Speaker

(Handset operation)
CN1 (6)→R200→C148→IC6 (10) (11)→R69→C57→IC1 [(22)→Handset SP AMP→(20) (21)]→Handset Speaker

6) Alarm Tone (2222 Hz) and ATAS Beep Tone (1389 Hz)
Alarm: CN1 (6)→R100→R199→C10→IC11 [(6)→POWER AMP→(3)]→C65→Speaker
Beep 1: CN1 (6)→R200→R199→C10→IC11 [(6)→POWER AMP→(3)]→C65→Speaker

IC1 Control Table

		IC1 Input Logic			IC1 Internal Switch				
		S/H	RMUTE	TMUTE	SW1	SW2	SW3	SW4	SW5
Handset Mode	Communication	0	0	0	○	○	X	X	X
	Transmission Mute	0	0	1	X	○	X	X	X
	Dial	0	1	1	X	X	X	X	X
Speakerphone Mode	Communication	1	0	0	X	X	○	○	○
	Transmission Mute	1	0	1	X	X	○	X	○
	Dial	1	1	1	X	X	X	X	○
Other		0	1	---	X	X	X	X	X

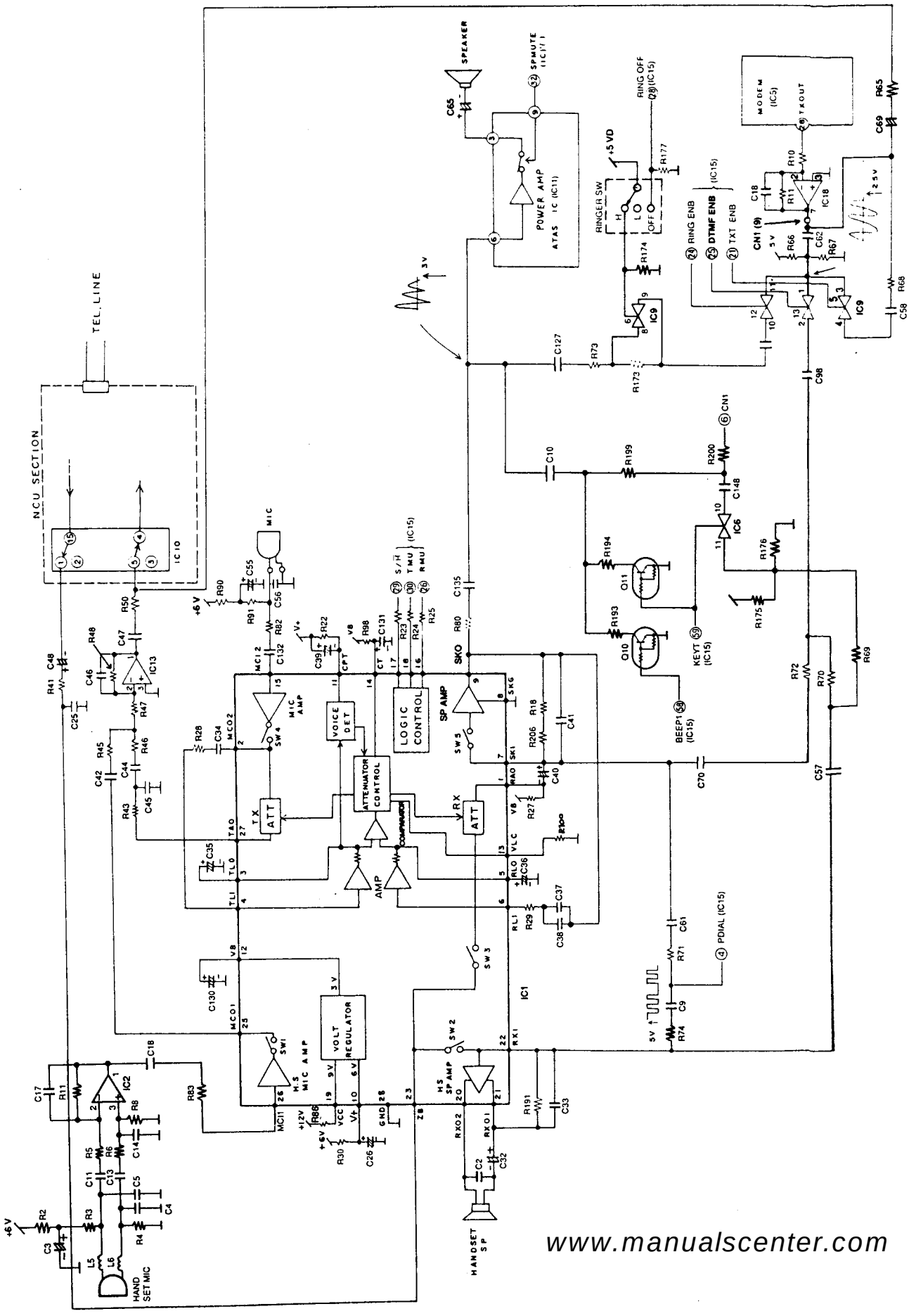
0: Low Level(0V) 1: High Level(5V) O: ON X: OFF

Monitor Tone Control Table

	S/H	RMUTE	TMUTE	SP MUTE	BELL ENB	DTMF ENB	TXT ENB	PDIAL	Beep1	KEYT	MODEM TXOUT
Bell Ringing	0	1	---	0	1	0	0	1	0	0	Bell Out
Handset Tone Dial	0	1	1	1	0	1	1	0	0	0	DTMF Out
Speakerphone Tone Dial	1	1	1	0	0	1	1	0	0	0	DTMF Out
Handset Pulse Dial	0	1	1	1	0	0	0	1/0	0	0	X
Speakerphone Pulse Dial	1	1	1	0	0	0	0	1/0	0	1/0	X
Beep 2 Line transmission	0	1	---	1	0	0	1	0	0	0	Beep2 Out
Alarm Ringing	0	1	---	0	0	0	0	---	0	0	X
Beep 1 Ringing for ATAS	0	1	---	0	0	0	0	0	1/0	0	X
Key Tone Ringing	0	1	---	0	0	0	0	---	0	1/0	X

1: High Level(5V) 0: Low Level(0V) Beep 1/1400 Hz/KEYT: 1389 Hz ALARM: 2222 Hz

Circuit Diagram



8. ATAS (Automatic Telephone Answering System) SECTION

8-1. MAIN SECTION

1) Function

The ATAS main operation is executed by the special IC11. Control signal for changing internal IC route are input to gate array IC15.

2) Signal Path and Circuit Operation

(Record)

(1) OGM Record (from microphone)
MIC→R134→C96→IC11 [(10)→ATT→MIC AMP→SW4→(21)]→Q14→R150→C123→IC7 (17)

(2) OGM Record (from line)
TEL. Line→NCU Section [IC10 (15) (1)]→R85→C53→C54→IC8 (6) (7)→C97→R135→IC11 [(11)→ATT→SW5→(21)]→Q14→R150→C123→IC7 (17)

(3) ICM Record (from line)
TEL. Line→NCU Section [IC10 (15) (1)]→R85→C53→C54→IC8 (6) (7)→C97→R135→IC11 [(11)→ATT→SW5→(21)]→Q14→C112→R101→C109→IC11 [(19)→REC AMP→SW6-B→SW7→(18)]→C110→CN9 (1)→R/P Head

(4) Memo Record
MIC→R134→C96→IC11[(10)→ATT→MIC AMP→SW4→(21)]→Q14→C112→R101→C109→IC11[(19)→REC AMP→SW6-B→SW7→(18)]→C110→CN9(1)→R/P Head

(5) Write the Beep1 to ICM Tape
CN1 (6)→C113→R159→C109→IC11 [(19)→REC AMP→SW6-B→SW7→(18)]→C110→CN9 (1)→R/P Head

(Playback)

(1) ICM Play (to speaker)
R/P head→C110→IC11[(18)→OGM AMP→PLAY AMP→SW6-A→(21)]→Q14→C112→IC11[(22)→SP AMP→SW2→(7)]→C82→VR3→R75→R136→C94→IC8 (2) (1)→C63→R92→IC11 [(6)→POWER AMP→SW1→(3)]→C65→Speaker

(2) ICM Play (to line)
R/P head→C110→IC11[(18)→OGM AMP→PLAY AMP→SW6-A→(21)]→Q14→C112→IC11[(22)→L-OUT AMP→SW3→(24)]→C87→R163→R156→IC16 (3) (1)→C67→R119→NCU Section [IC10 (5) (4)]→TEL. Line

(3) OGM Play (to speaker)
IC7 (12)→C143→C145→IC14 (2) (1)→C146→R184→R148→R147→IC14 (6) (7)→R151→C43→C112→IC11 [(22)→SP AMP→SW2→(7)]→C82→VR3→R75→R136→C94→IC8 (2) (1)→C63→R92→IC11 [(6)→POWER AMP→SW1→(3)]→C65→Speaker

(4) OGM Play (to line)
IC7 (12)→C143→C145→IC14 (2) (1)→C146→R184→R148→R147→IC14 (6) (7)→R151→C43→C112→IC11 [(22)→L-OUT AMP→SW3→(24)]→C87→R163→R156→IC16 (3) (1)→C67→R119→NCU Section [IC10 (5) (4)]→TEL. Line

(VOX)

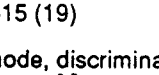
The VOX circuit is the circuit for discrimination of tone or no tone. [IC11 pin (25) is low level with tone and high level with no tone.] The role of this circuit is explained in the following.

(1) When no tone is recognized at the time of ICM recording from the line, the recording is ended.

TEL. Line→NCU Section [IC10 (15) (1)→R85→C53→C54→IC8 (6) (7)→C97→R135→IC11 [(11)→ATT→L-IN AMP→SW5→(21)]→Q14→C112→C102→R169→R122→IC11 [(27)→VOX DETECTION CIRCUIT→(25)]→R170→IC15 (19)

(2) When no tone is recognized at the time of OGM recording from the microphone, the recording is ended.
This is done because suitable OGM sending to line is not possible when recording is not done at or above a certain level.

MIC→R134→C96→IC11[(10)→ATT→MIC AMP→SW4→(21)]→Q14→C112→IC11[(22)→VOX DETECTION CIRCUIT→(25)→R170→IC15 (19)

(3) In ANS/FAX mode, discrimination of FAX or human is made for 5 sec after OGM transmission, and in case of no tone or CNG signal (

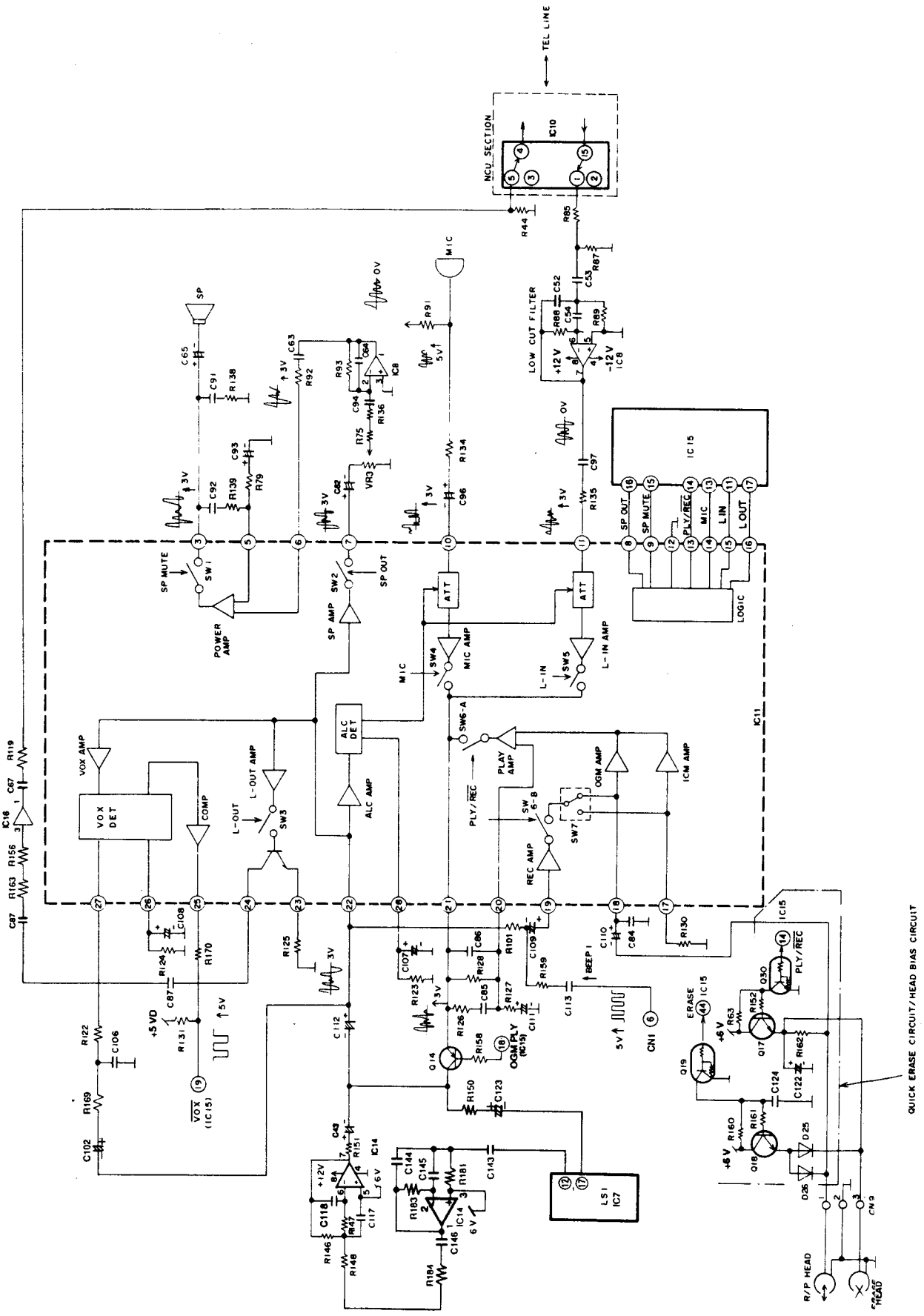
): Identification signal that a FAX is on the transmission side), shifting is made to the FAX side. In case of a voice signal, shifting is made to ICM recording.
The path is the same as for 1). Discrimination between CNG signal and voice signal is executed by the CPU monitoring the input to IC15 pin (19) and using a certain algorithm.

Control Table for ATAS Main Section

	SW2 ON by High SPOUT	SW1 OFF by High SPMUTE	SW6-A ON, SW6-B OFF, Q17 OFF by High PLY/REC	SW4 ON by High MIC	SW5 ON by High LIN	SW3 ON by High LOUT	Q14 OFF by High OGMPLY	Q19 OFF by High ERASE
Wait Condition	0	1	1	0	0	0	1	1
During the Speaker-phone Communication	0	0	1	0	0	0	1	1
During the Dial	0	0	1	0	0	0	1	1
Aoto Mode (after OGM send, 5sec)	1	1	0	0	1	0	0	1
During the Quick Erase	0	1	0	0	1	0	1	0
Beep Record (to Tape)	0	1	0	0	0	0	1	1
OGM Record (from Microphone)	0	1	0	1	0	0	0	1
OGM Record (from Line)	1	0	0	0	1	0	0	1
ICM Record (from Line)	1	0	0	0	1	0	0	1
Memo Record	0	1	0	1	0	0	0	1
ICM PLAY (to Speaker)	1	0	1	0	0	0	0	1
ICM Play (to Line)	1	0	1	0	0	1	0	1
OGM Play (to Speaker)	1 0	0 1	1 1	0 0	0 0	0 1	1 1	1 1
OGM Play (to Line)	0	1	1	0	0	1	1	1

1: High Level (5V) 0: Low Level (0V)

Circuit Diagram



8-2. OGM RECORD/PLAYBACK CIRCUIT

1) OGM Recording

The voice signal input from microphone or line is output from the special ATAS IC11 pin (21), passes through Q14, and enters the voice synthesizer LSI IC7 pin (17). In the IC, the signal is stored in analog memory array in IC7. The control timing chart is shown in Fig. 1.

IC11 (21)→Q14→R150→C123→IC7 (17)

2) OGM Playback

The voice signal stored in analog memory array in IC7 is output from pin 12 and passes through band pass filter IC14, the signal enters the special ATAS IC11 pin (22) via C112, and it is output to the speaker or to the line. The control timing is shown in Fig. 1.

(Line Send Operation)

IC7 (12)→C143→C145→IC14 (2) (1)→C146→R184→R148→R147→IC14 (6) (7)→R151→C43→C112→IC11 (22) (24)→NCU Section [IC10 (5) (4)]→TEL. Line

(Speaker Output Operation)

IC7 (12)→C143→C145→IC14 (2) (1)→C146→R184→R148→R147→IC14 (6) (7)→R151→C43→C112→IC11 (22) (7)→C82→VR3→R75→R136→C94→IC8 (2) (1)→C63→R92→IC11 (6) (3)→C65→Speaker

Timing Chart

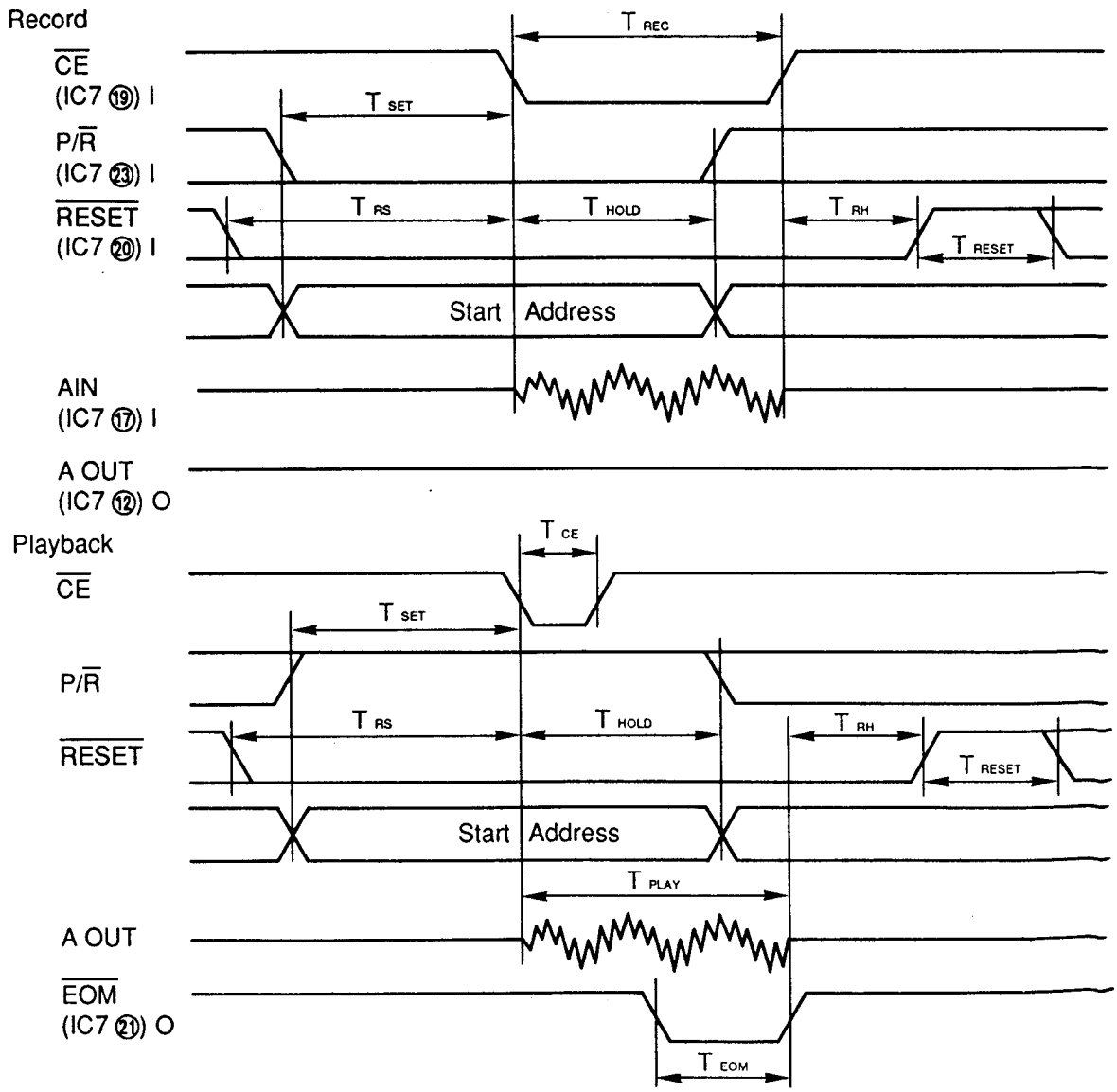
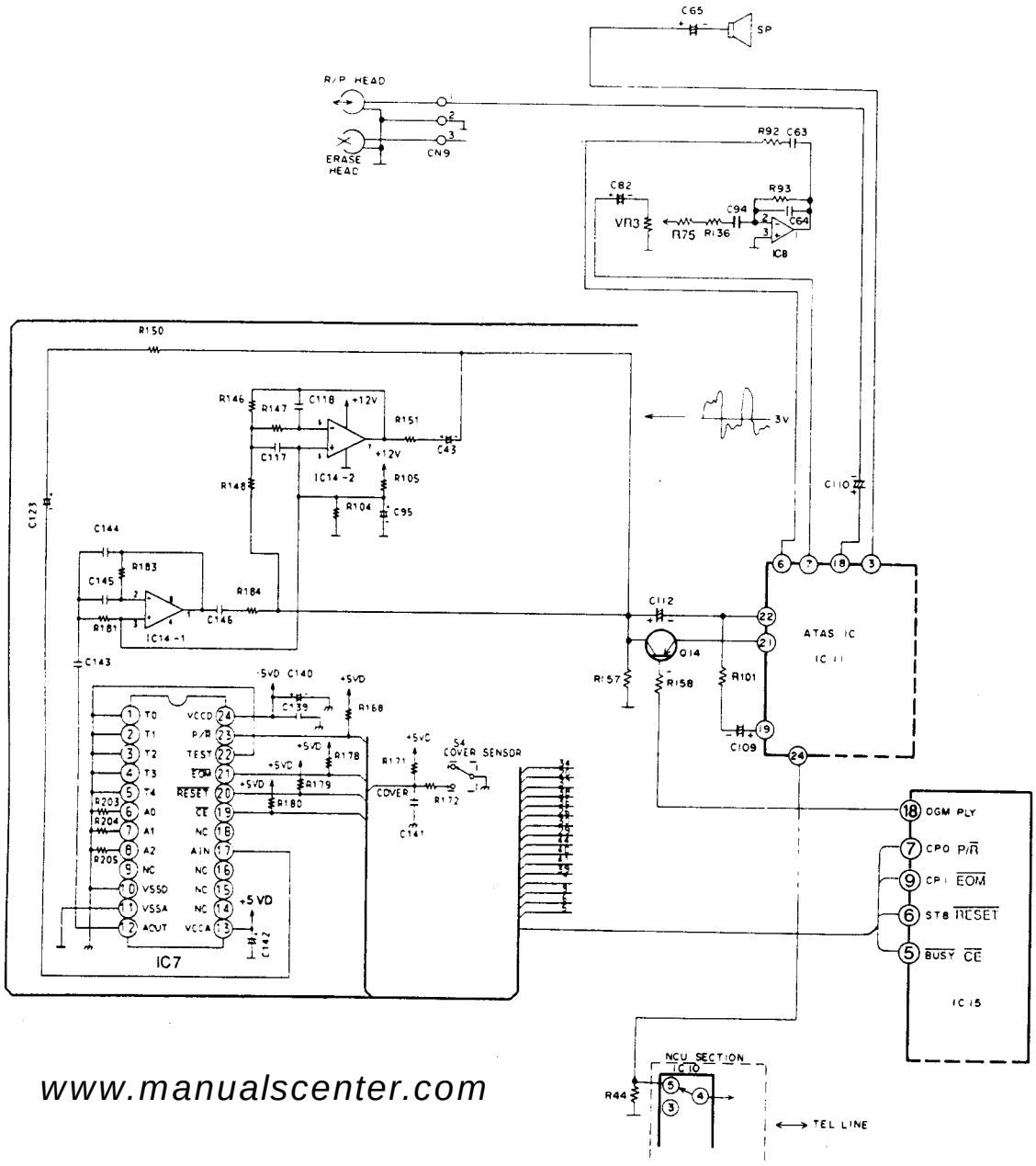


Fig. 1

Circuit Diagram



8-3. REMOTE SIGNAL DETECTION CIRCUIT

1) Circuit Operation

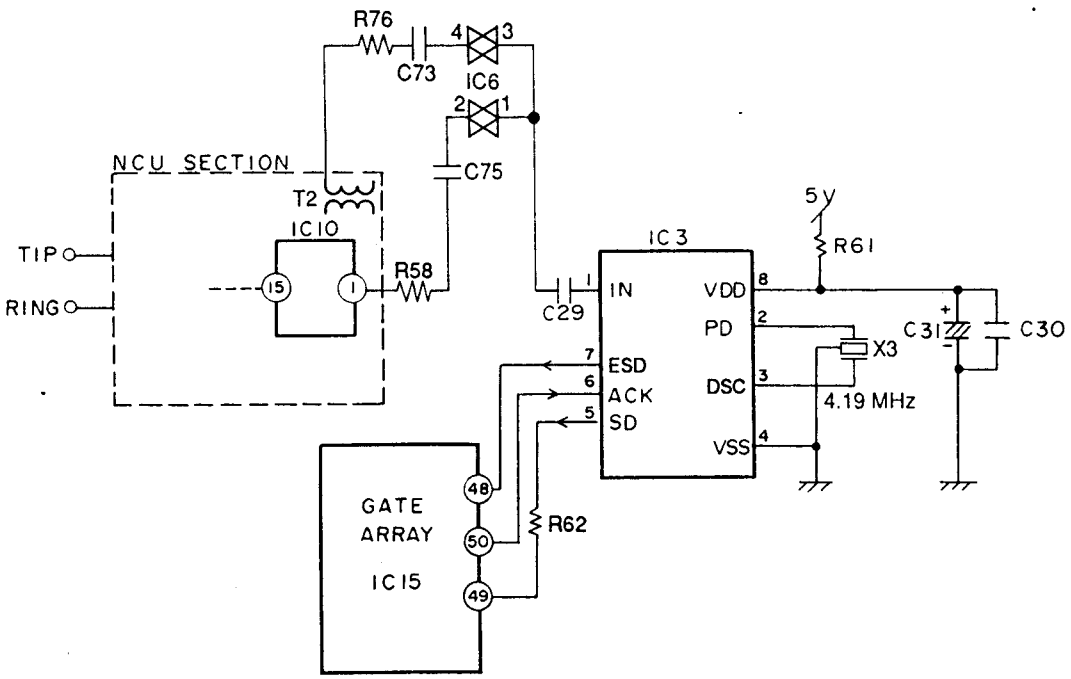
The DTMF signal is used as control signal. The remote signal enters from the telephone line or from external telephone, passes through the NCU section, and enters at pin 1 of IC3. IC3 converts this signal to 4 bit serial data which enters the gate array IC15.

The timing chart for the signals is shown below.

<ATAS Remote Control from calling party>

Telephone Line→NCU Section [IC10 (15) (1)]→R58→C75→IC6 (2) (1)→C29→IC3 (1)

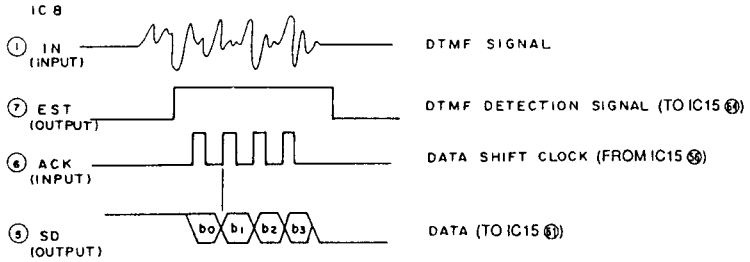
Circuit Diagram



<FAX Remote Control from external telephone>

EXT. TEL→T2→R76→C73→IC6 (4) (3)→C29→IC3 (1)

Timing Chart



8-4. QUICK ERASE AND HEAD BIAS CIRCUITS

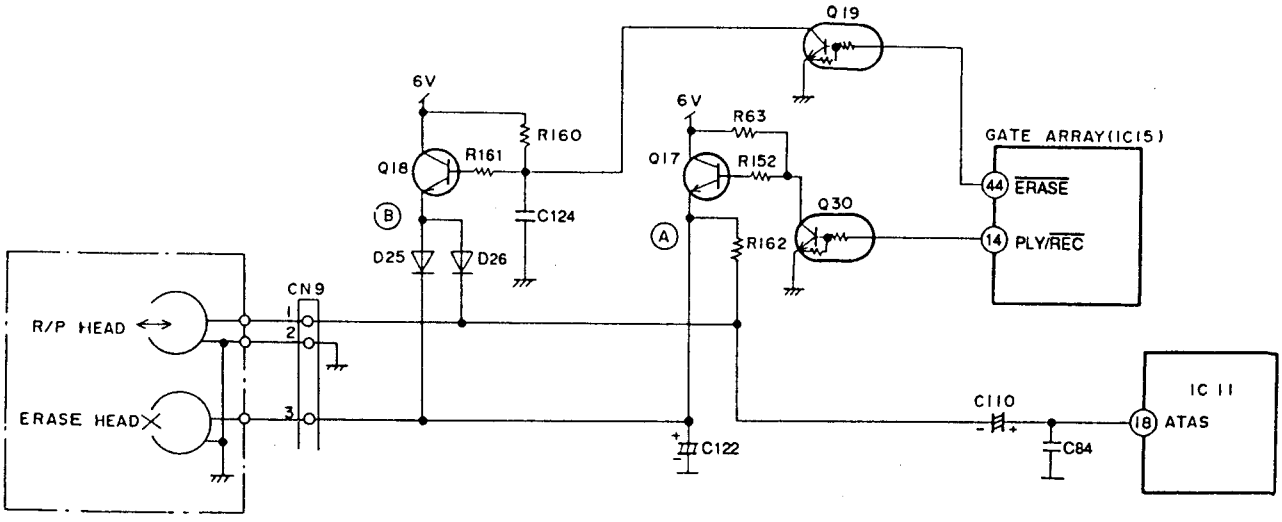
1) Circuit Operation

(Tape Record Operation)
The gate array IC15 pin (14) becomes low level, Q30 becomes OFF, Q17 becomes ON, the voltage at point (A) becomes about 5V, and the DC bias current (about 130μA) flows via R162 to the record/playback head.
The recording current from IC11 pin (18) is superimposed onto this bias current, and the result is recorded.
At the time of recording, the erasing current (about 25mA) first flows through the erase head to erase previous recording contents.

(Tape Playback Operation)
The gate array IC15 pin (14) becomes high level, Q30 becomes ON, Q17 becomes OFF, the DC bias current does not flow to the record/playback head, and the playback signal (about -60dB) from the record/playback head passes through C110 and enters IC11 pin (18).

(Quick Erase Operation)
The gate array IC15 pin (44) becomes high level, Q18 becomes ON, the voltage at point (B) becomes about 5 V, and AC current (about 20mA) flows via D25, D26 to the record/playback head and to the erase head. In other words, after erasing by the erase head, a no-tone recording is made by record/playback head for perfect erasing.

Circuit Diagram



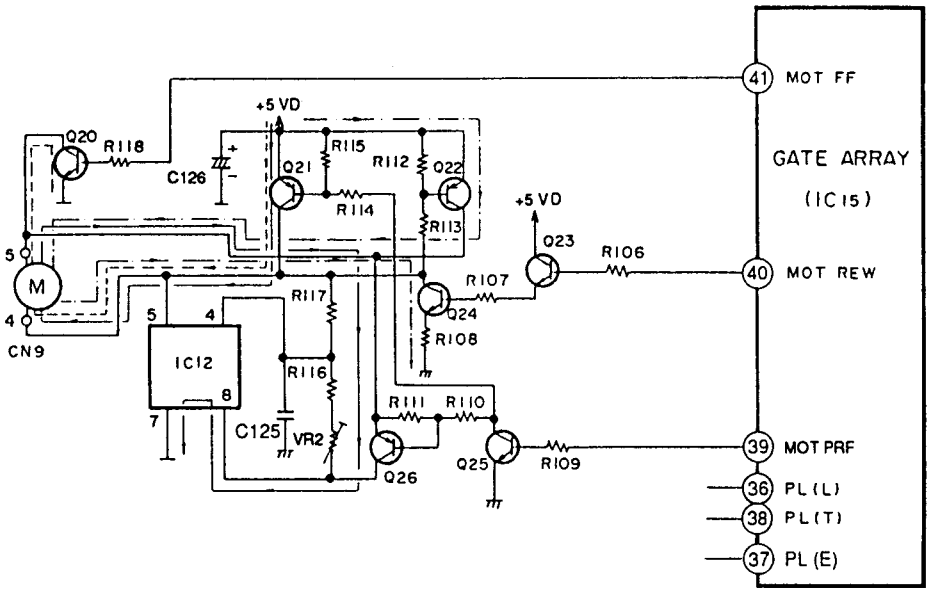
8-5. MOTOR (FOR CASSETTE DECK) DRIVE CIRCUIT

1)Playback (or Recording) (——→)
IC15 pin 39 becomes high level, and Q25 goes ON, hence Q26 and Q21 go ON, the governor IC12 operates, the motor current is controlled by IC12, hence the motor rotates at a constant speed.

2) Fast Forward (- - - →)
IC15 pins 39 and 41 becomes high level and Q25 and Q20 go ON, hence Q21 goes ON, and as the current does not pass through the governor IC12 and the plunger also is not pulled, the motor rotates at high speed.

3) Rewind (— - - →)
IC15 pin 40 becomes high level and Q23 and Q24 go ON consequently, Q22 also goes ON, and the motor current flows through Q22→Motor→Q24. Because this is the reverse direction to the current which flows in the above fast forward mode, the motor rotates at high speed in the reverse direction.

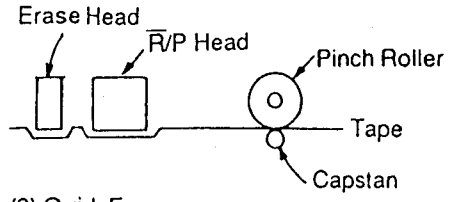
Circuit Diagram



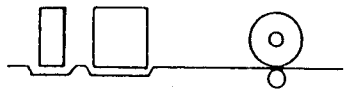
8-6. TAPE TRANSPORT CONTROL CIRCUIT

1) Circuit Operation
The position relation between tape and erase head and record/playback head is decided by plunger control PL(L), PL(T). When PL (L) and PL (T) both are high level, Q28, Q27 and Q29 become ON, current flows from +12V (——→) to the plunger, the plunger is started, and the head is shifted to the position where it comes into contact with the tape. Afterwards, a holding current (- - - →) flows from +5 V to hold this position. At this time, PL (T) is low level and PL (E) is high level, Q28 and Q27 are OFF, and Q16 and Q29 are ON. At the time of (3) fast forward, Rewind in Fig. 1 PL (T), PL (L) and PL (E) are low level, and the tape is not in contact with the heads. At the time of (1) Playback/Record and at the time of (2) Quick Erase, PL (L) and PL (E) are held at high level, and the tape is in contact with the heads. At the time of playback/record, the pinch roller is slightly further on the capstan side that at the time of quick erase, and the tape is caught between capstan and pinch roller for suitable loading, so that constant speed becomes possible.
The timing chart for motor and plunger control is shown in Fig. 2.

(1) Playback/Record



(2) Quick Erase



(3) Fast Forward, Rewind

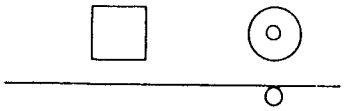
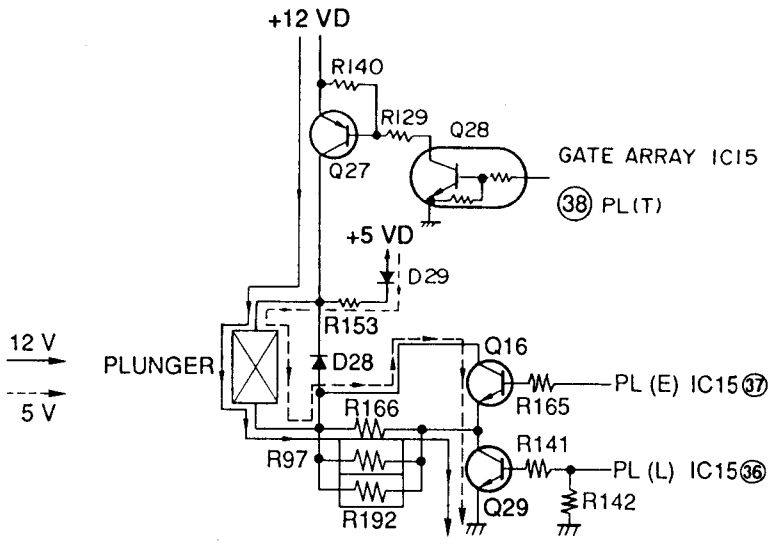


Fig. 1

Circuit Diagram



Path of the current flowing to the plunger when PL(T) and PL(L) both are high level.

Path of the current flowing to the plunger when only PL(L) is high level.

Timing Chart

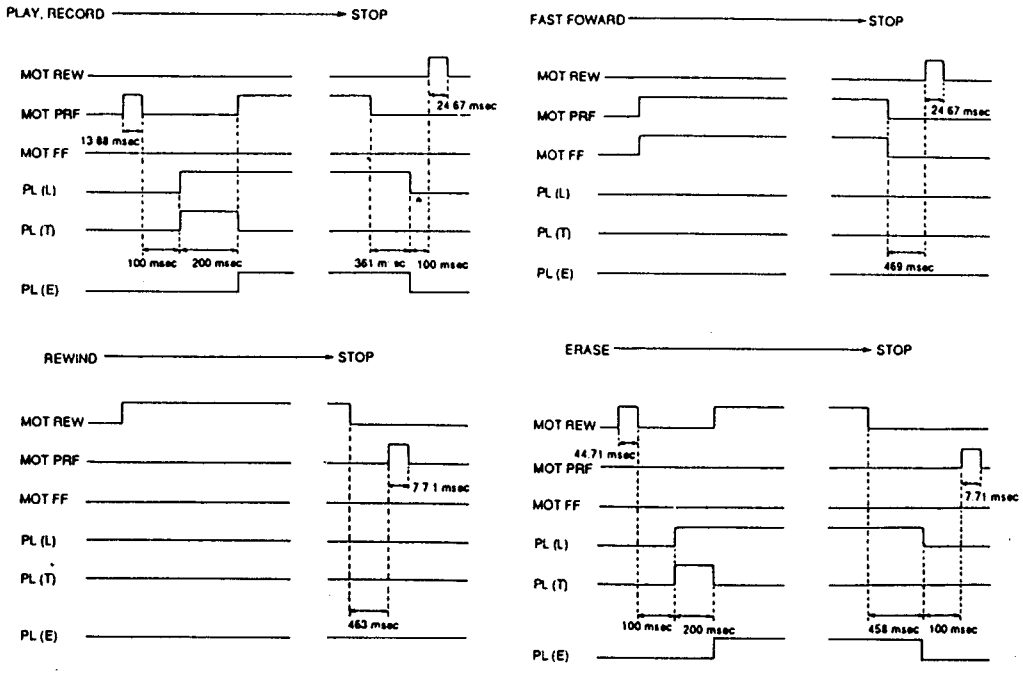


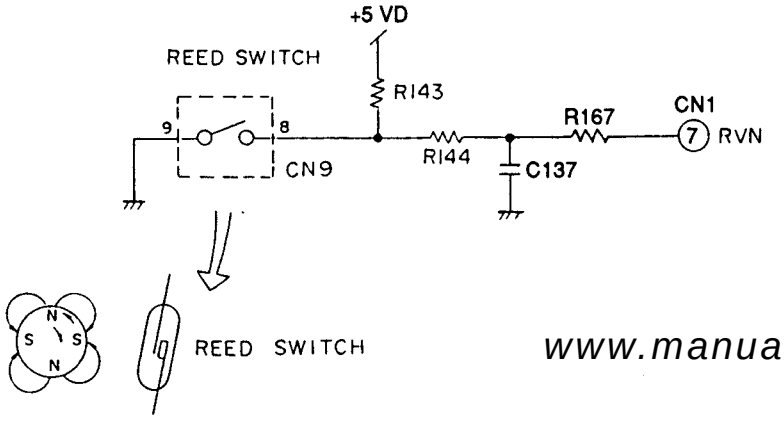
Fig. 2

8-7. ICM TAPE ROTATION DETECTOR CIRCUIT

1) Circuit Operation

The changes in the direction of the magnetic field caused by the rotation of the four-pole ferrite magnet are detected by the reed switch; this output is added to the pin 7 of CN1.

Circuit Diagram



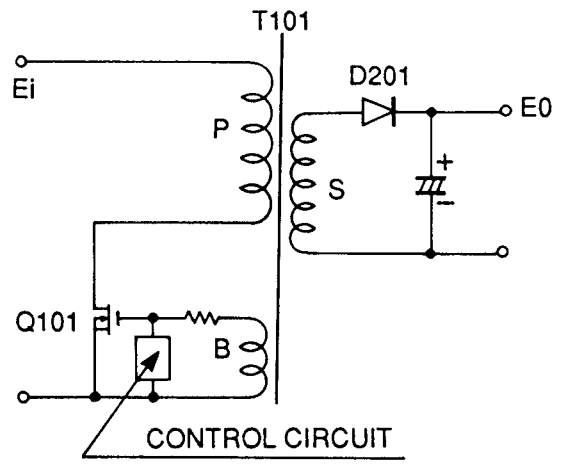
9. SWITCHING POWER SUPPLY SECTION

1) Circuit operation

A. INPUT CIRCUIT
AC power goes to input rectifier circuit through filter circuit and inrush limiter. Filter circuit works for both decrease RFI noise and eliminate line transient noise. (See circuit diagram.)

B. RECTIFIER CIRCUIT
AC powe is rectified by D101 and charge C109 to make high DC voltage, then supply power to converter circuit.
Kick-on voltage for control IC (MC101) is supplied from AC power through R102, R103, R104, when turn-on, inrush current is limited by TH101. (See circuit diagram.)

C. CONVERTER CIRCUIT
The converter circuit of this power supply is named ringing choke converter (RCC).
We explain the operation of this circuit with the brief circuit.



P...PRIMARY WINDING

S...SECONDARY WINDING

B...CONTROL WINDING

In the above circuit, when the transistor Q101 is ON, secondary rectifier diode D201 is OFF and the energy is charged in the transformer T101.
And Q101 continues being ON for the voltage generated by control winding (B).
In the next, Q101 is turned OFF by control circuit, then each windings of T101 change the polarity and rectifier diode D201 turns ON.
The charged energy of T101 supplies power through D201 to output load.
And the voltage of control winding is decreased and Q101 continues being OFF state.
When all energy is discharged through D201, Q101 kicked ON again and each windings of T101 change polarity and goes to self oscillation.
Operating frequency is high when input voltage Ei is high, and that is low when output current is much.

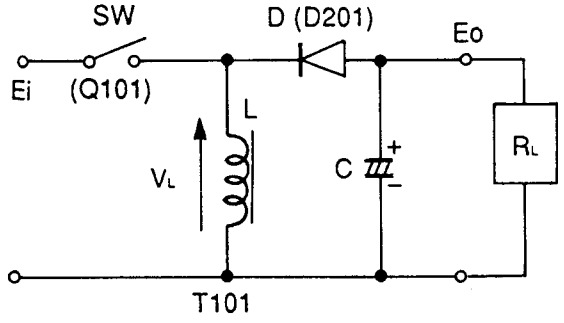
The value of output voltage is

$$Eo = \frac{\delta}{1-\delta} \bullet Ei$$

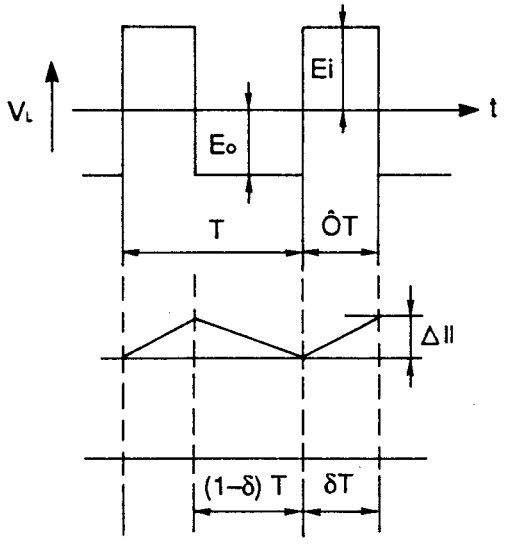
$$\delta = \frac{T_{ON}}{T_s}$$

T_{ON}: ON TIME OF Q101
T_s: PERIOD OF OSCILLATION

Equivalent circuit model for the RCC



In the equivalent circuit:
When SW is ON, current flows
SW→L
When SW is OFF, current flows
L→D→R_L



The value of inductance increases current between ON period (δ • T).

$$\Delta II = \frac{Ei}{L} \bullet \delta \bullet T \text{— (1)}$$

The value of inductance decreases current between OFF period [(1−δ) • T].

$$\Delta II = \frac{Eo}{L} (1-\delta) \bullet T \text{ — (2)}$$

From equations (1) and (2),

$$Eo = \frac{\delta}{1-\delta} \bullet Ei$$

In the actual circuit, the fixed output voltages are got by changing the winding ratio of the transformer T101.
In this converter circuit, the output voltages are stabilized by the control which the duty ratio of ON period and OFF period of the transistor changes according to the output voltages.
In this power supply, the bias winding is also built-in in the transformer.
This power supply has four outputs.
24 V output voltage is stabilized by detecting 24 V output voltage and changing the duty ratio. 5 V is stabilized by control circuit same as 24 output.
12 V and −12 V are stabilized by winding ratio.

D. CONTROL CIRCUIT AND ERROR DETECTING CIRCUIT

The control circuit amplifies the output of which duty ratio is made according to the error voltage detected by the error detecting circuit, and drives the main transistor Q101.

In this power supply, the method of changing the duty ratio is to change the ON period. It's as follows.

When the output voltage of 24 V circuit becomes higher, the current of photo coupler PC101 increases, the pulse width of output of control IC (MC101) becomes narrow and ON period of Q101 becomes shorter.

And this control IC (MC101) decides the minimum OFF period by itself.

When the oscillation frequency becomes higher and OFF period becomes the minimum OFF period, the OFF period remains unchanged and only the ON period decreases.

In this way, there is the upper limit of the oscillation frequency and the duty ratio is expanded. (See circuit diagram.)

E. OVER CURRENT LIMITER (O.C.L)

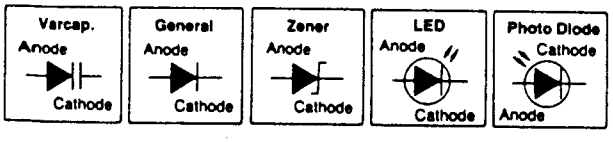
24 V outputs are limited by T_{ON} MAX limiter (on time of transistor Q101) which provided inside control IC (MC101). (See circuit diagram.)

5 V, 12 V, −12 V are limitted same as 24 V output.

Circuit Diagram...Refer to pages 183 and 184.

SCHEMATIC DIAGRAM

Notes:

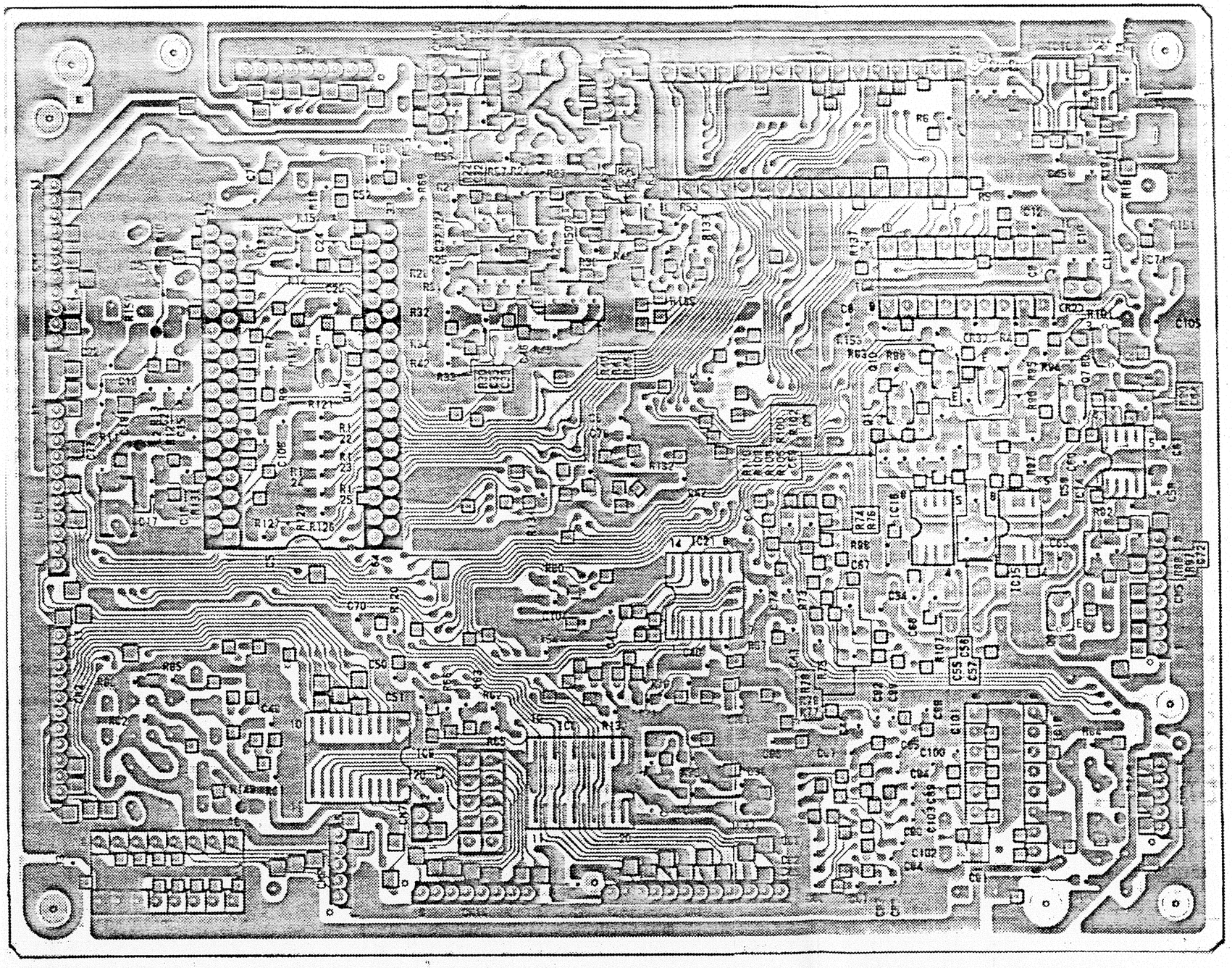
1. S1: Dialing mode selector switch in "TONE" position
2. S2: Hook switch in "ON-HOOK" position
3. S3: Ringer volume selector switch in "HIGH" position
4. S4: Cover open switch
5. Handset volume switch
6. DC voltage measurements are taken with oscilloscope from ground.
7. The schematic diagram and circuit board may be modified at any time with the development of new technology.
8. 

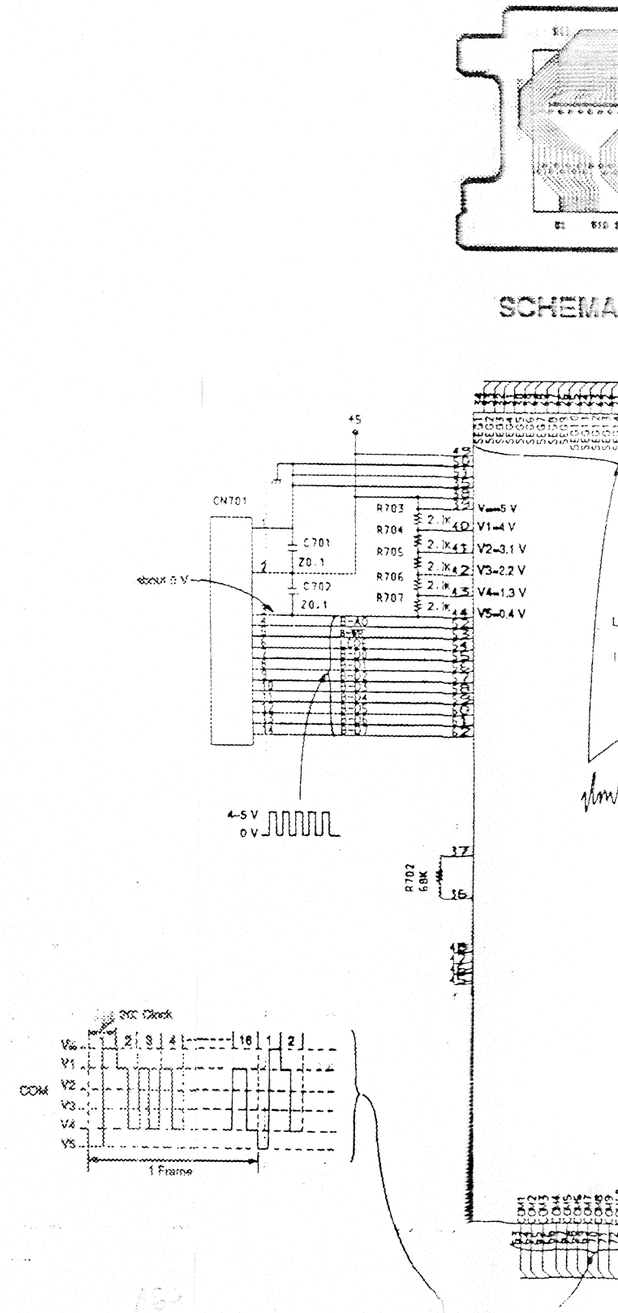
9. **Important safety notice**

The shaded area on this schematic diagram incorporates special features important for protection from fire and electrical shock hazards.
When servicing it is essential that only manufacturer's specified parts can be used for the critical components in the shaded areas of the schematic.

PRINTED CIRCUIT BOARD (DIGITAL BOARD)

(BOTTOM VIEW)

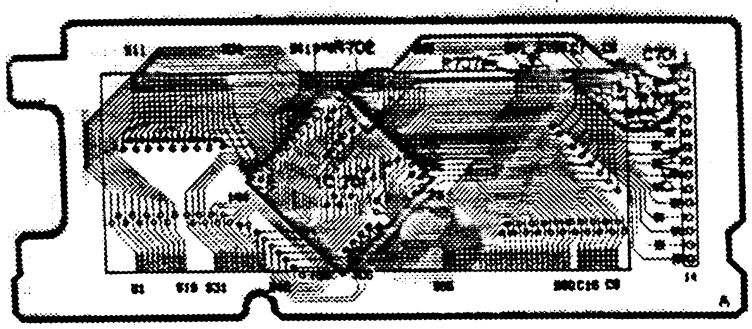




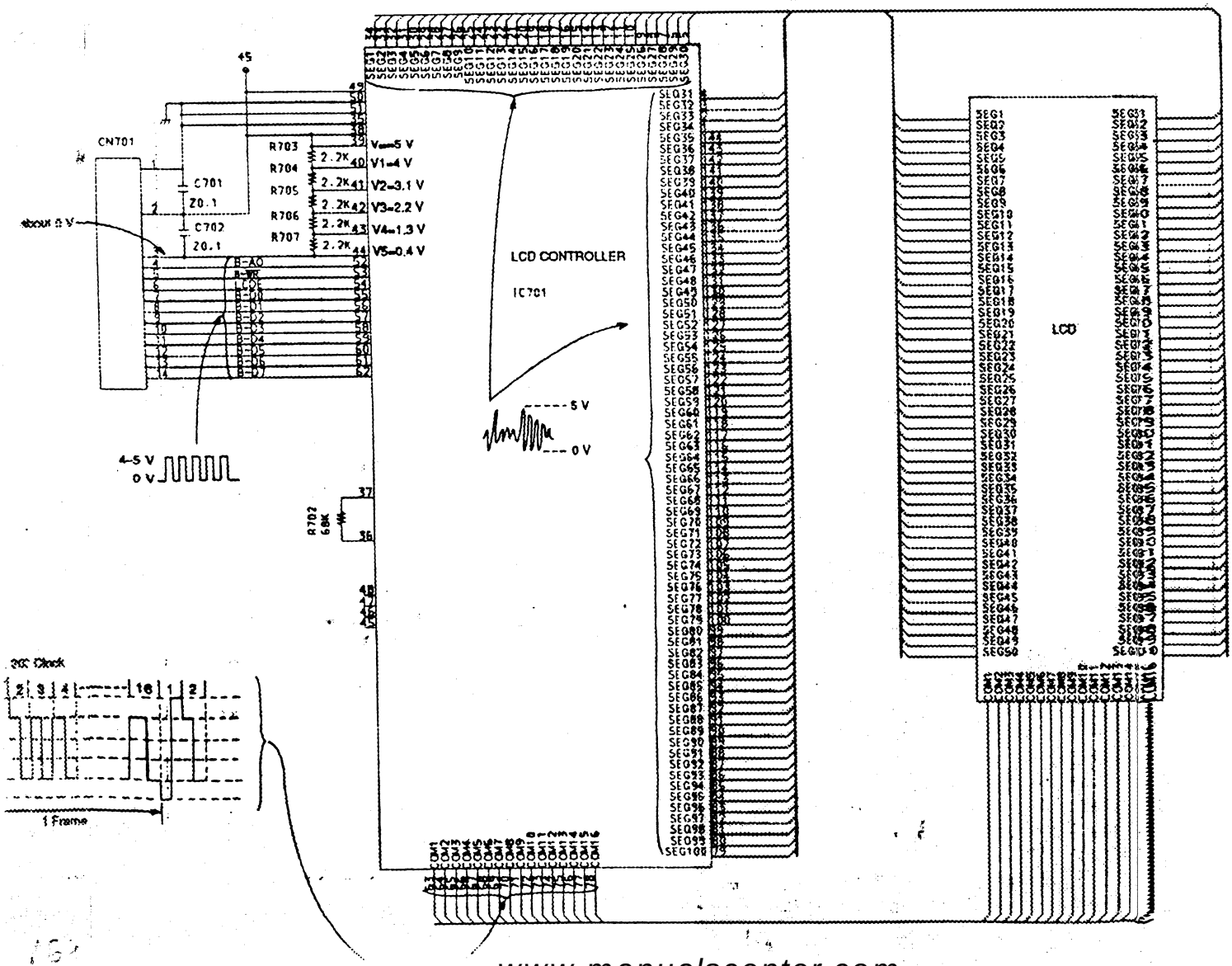
(LCD BOARD)

13 | 14 | 15 | 16 | 17 | 18 | 19

(COMPONENT VIEW)

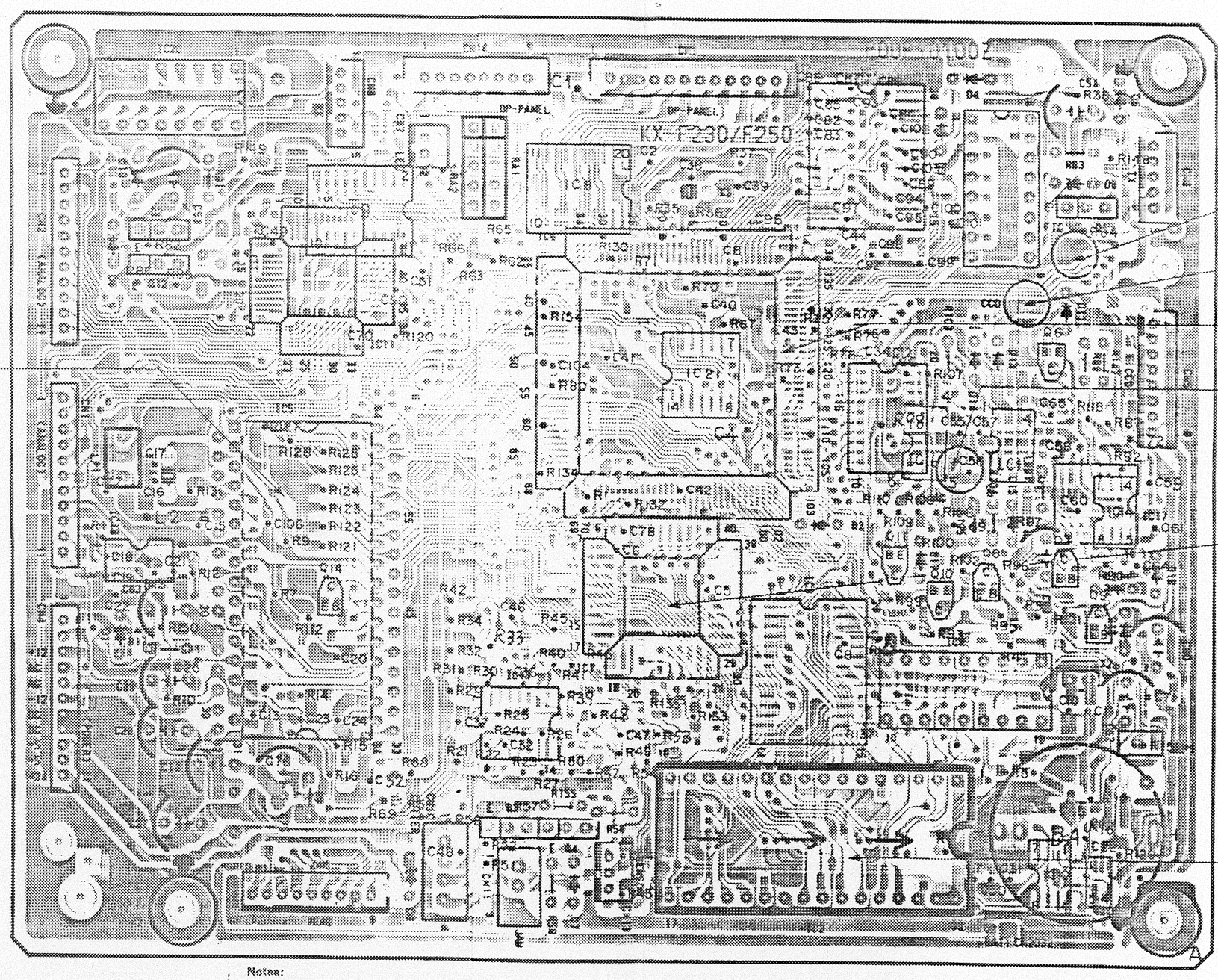


SCHEMATIC DIAGRAM (LCD CIRCUIT)



PRINTED CIRCUIT DIAGRAM (DIGITAL BOARD)

(COMPONENT VIEW)



IC5

Pin No.	Waveform
1	5 V / 0 V
2	
50–59	
61–64	
7	5 V / 0 V, 24 MHz

IC6

Pin No.	Waveform
22–29	5 V / 0 V
33–36	
39–43	
47–50	

IC1

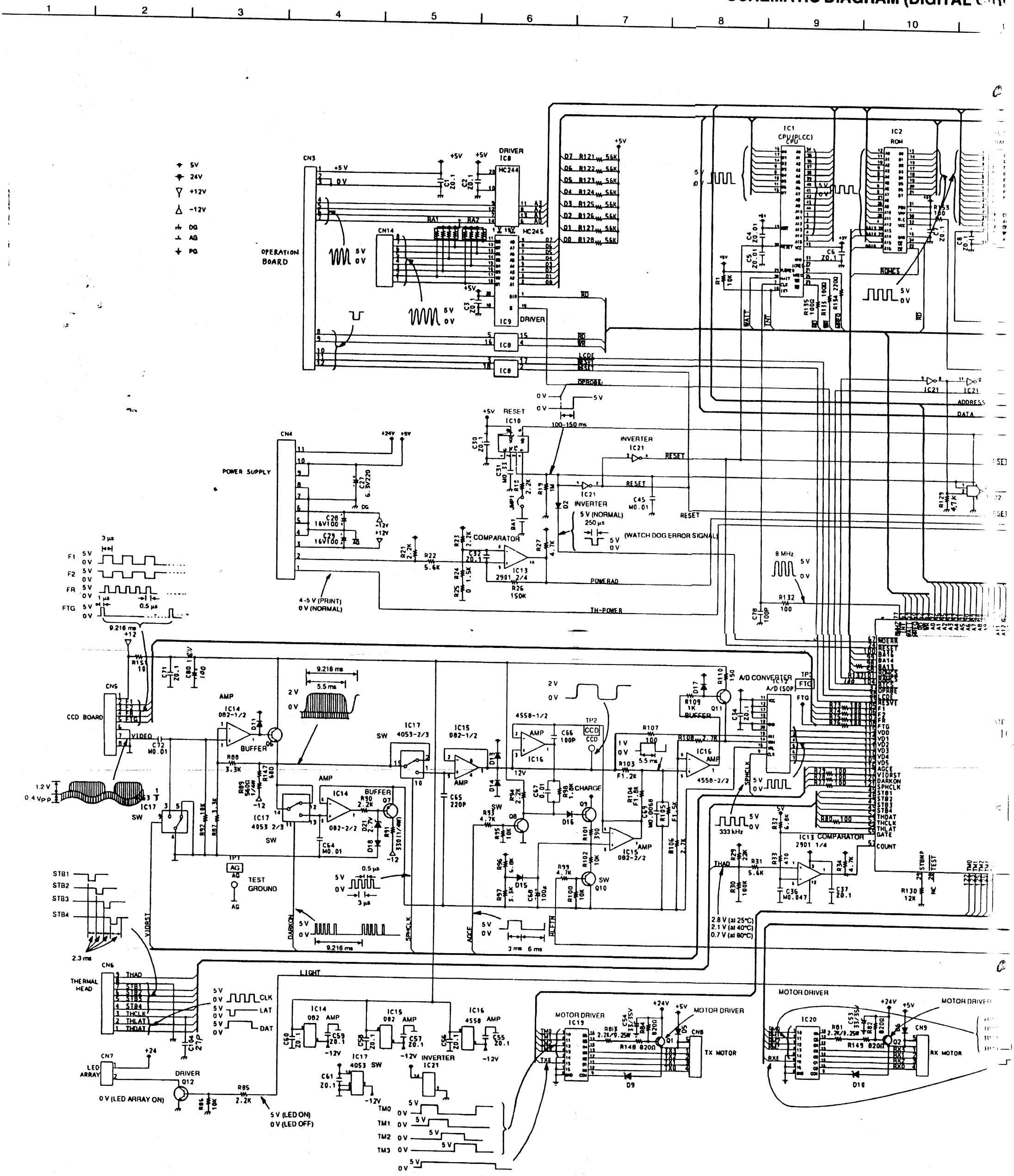
Pin No	Waveform
1–5	5 V / 0 V
9	
10	
11	
13–17	
34–44	

IC2

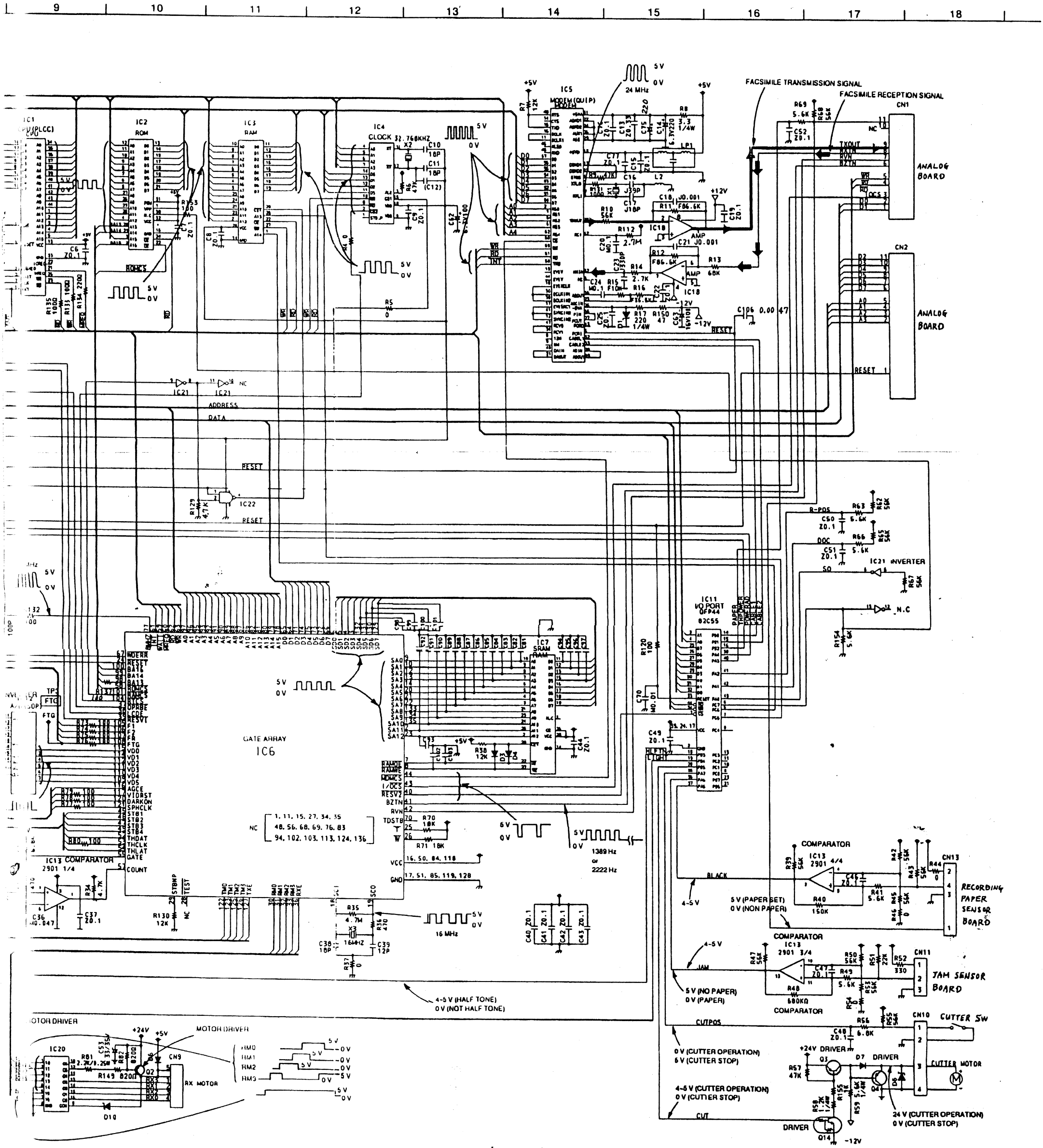
Pin No	Waveform
3–15	5 V / 0 V
17–21	

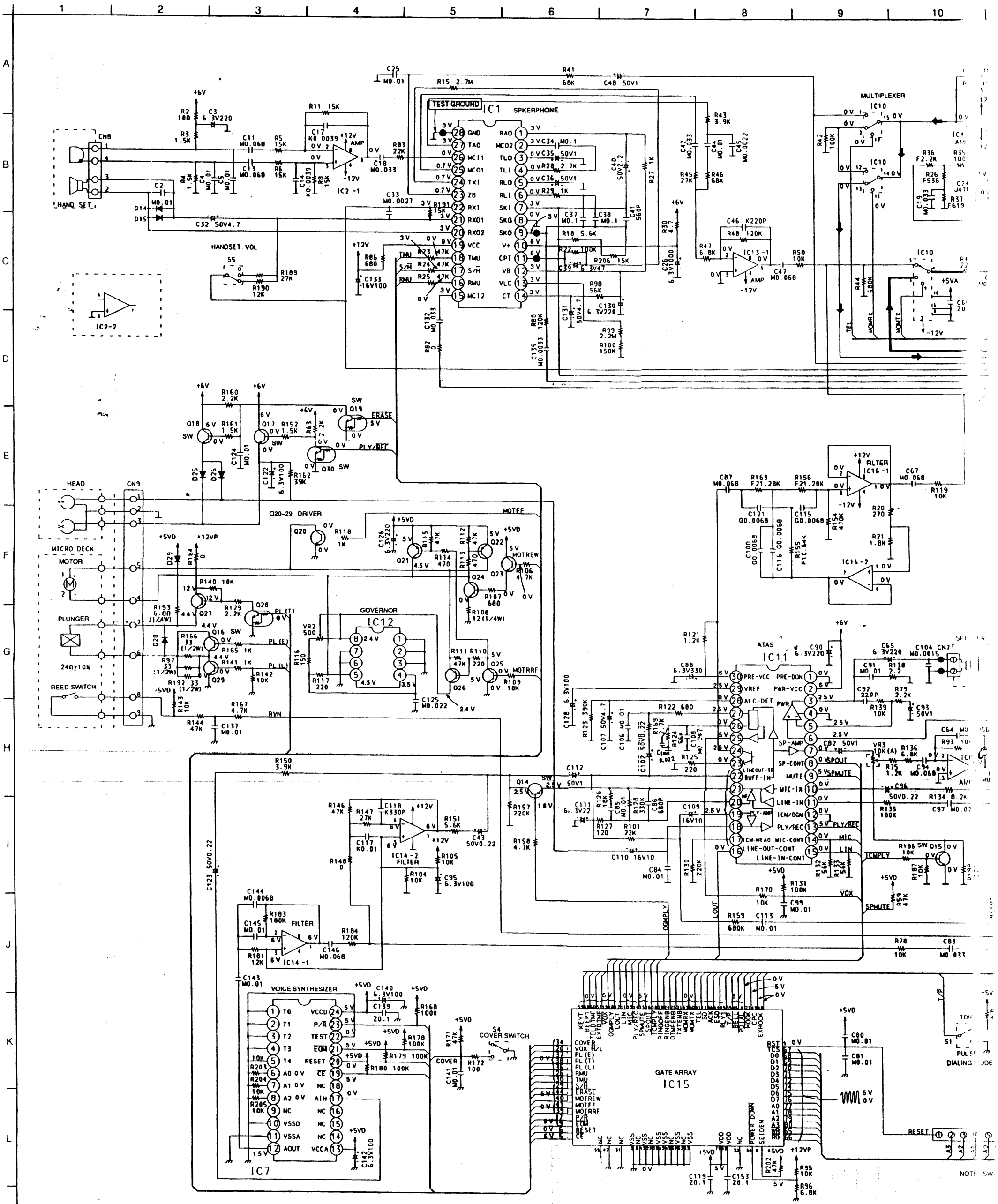
Notes:

1. The circuit shown in [ ] on the conductor indicates printed circuit on the back side of the printed circuit board.
2. The circuit shown in [ ] on the conductor indicates printed circuit on the front side of the printed circuit board.

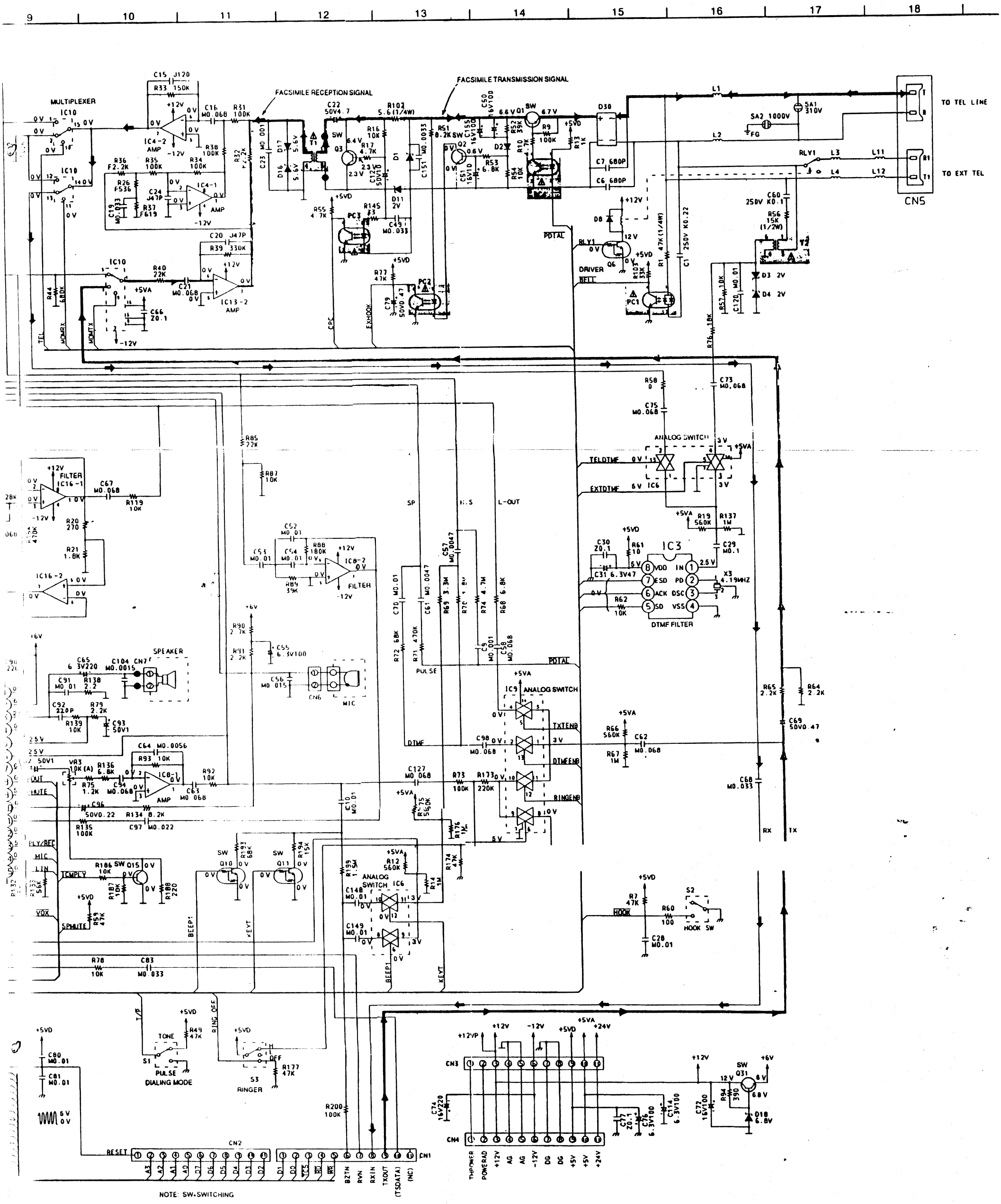


EMATIC DIAGRAM (DIGITAL CIRCUIT)





ATIC DIAGRAM (ANALOG CIRCUIT)

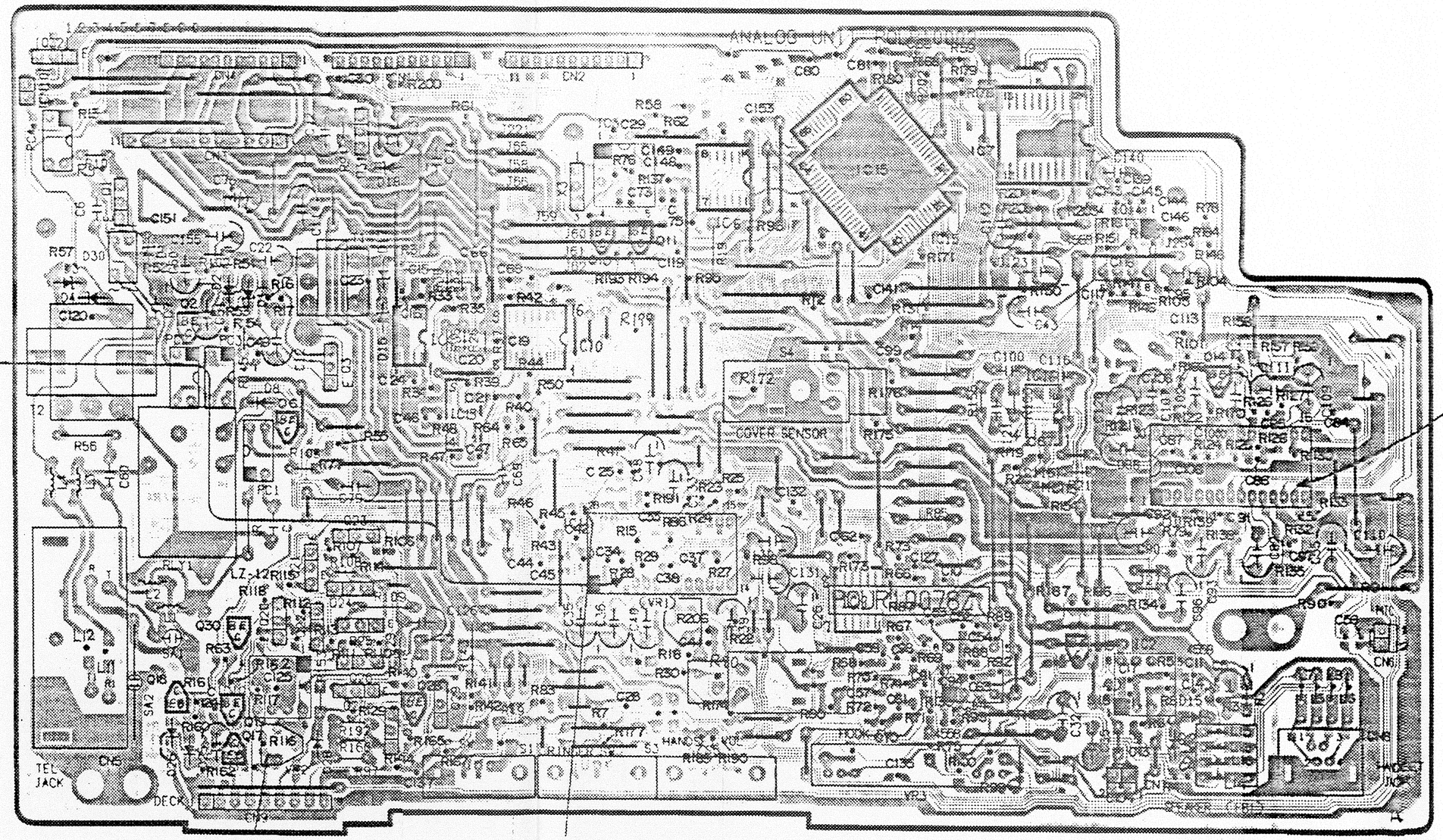


PRINTED CIRCUIT BOARD (ANALOG BOARD)

(COMPONENT VIEW)

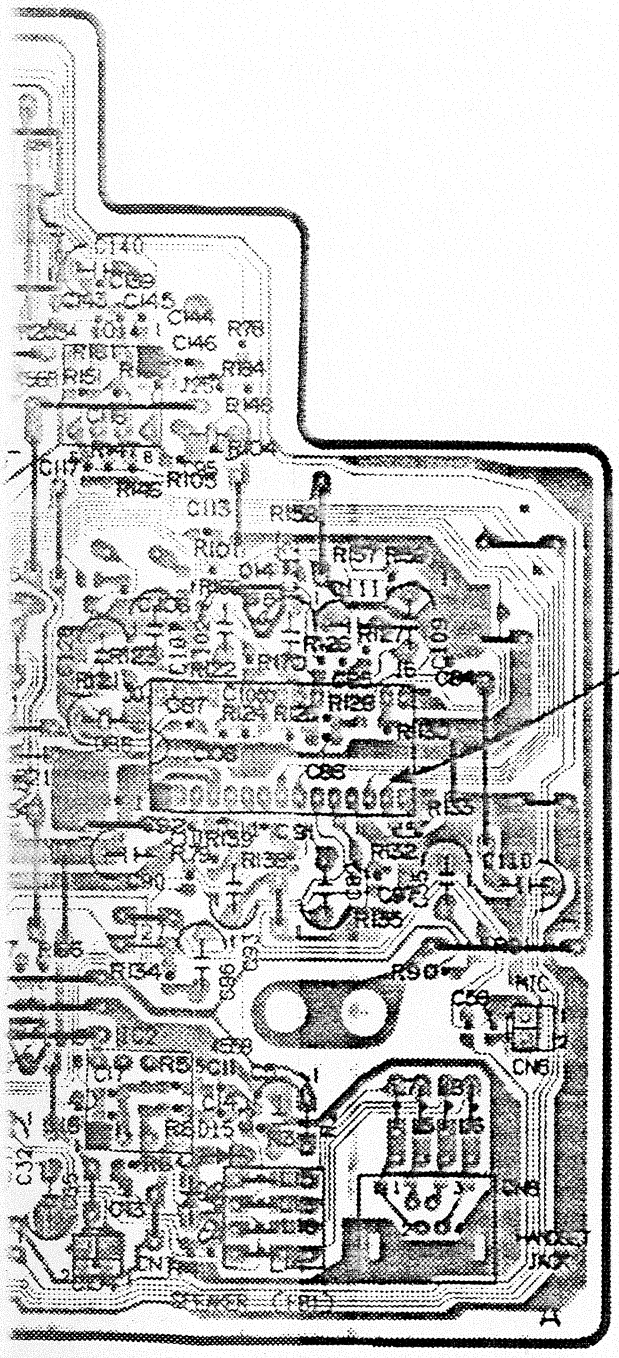
IC1

Pin No.	Voltage
1	3 V
2	3 V
3	0 V
4	0 V
5	0 V
6	0 V
7	3 V
8	0 V
9	3 V
10	5 V
11	6 V
12	3 V
13	3 V
14	3 V
15	3 V
16	0 V
17	3 V
18	0 V
19	9 V
20	3 V
21	3 V
22	3 V
23	0.7 V
24	0.7 V
25	0.7 V
26	0 V
27	3 V
28	0 V



Notes.

1. The circuit shown in ▭ on the conductor indicates printed circuit on the back side of the printed circuit board.
2. The circuit shown in ▭ on the conductor indicates printed circuit on the front side of the printed circuit board.



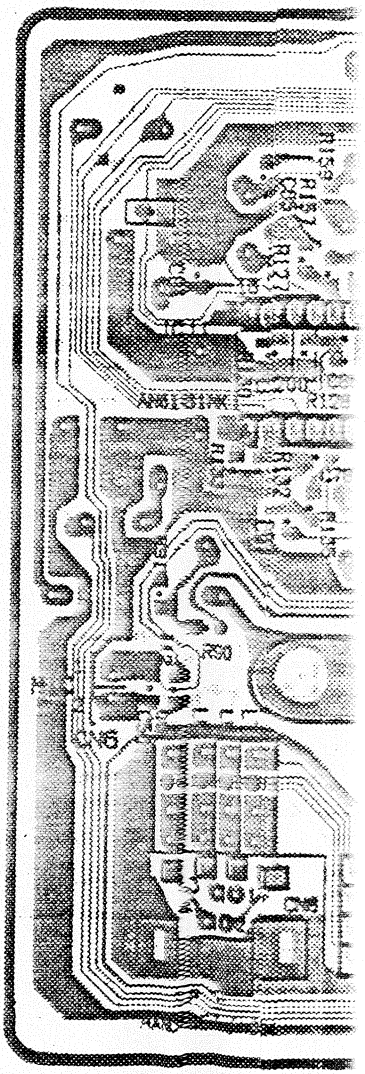
IC11

Pin No.	Voltage
1	0 V
2	6 V
3	2.5 V
4	0 V
5	2.5 V
6	2.5 V
7	0 V
8	0 V
9	5 V
10	0 V
11	0 V
12	0 V
13	5 V
14	0 V
15	0 V
16	0 V
17	2.5 V
18	2.5 V
19	2.5 V
20	2.5 V
21	2.5 V
22	2.5 V
23	0 V
24	2.4 V
25	5 V
26	0 V
27	2.5 V
28	0 V
29	2.5 V
30	6 V

or indicates printed
ard.

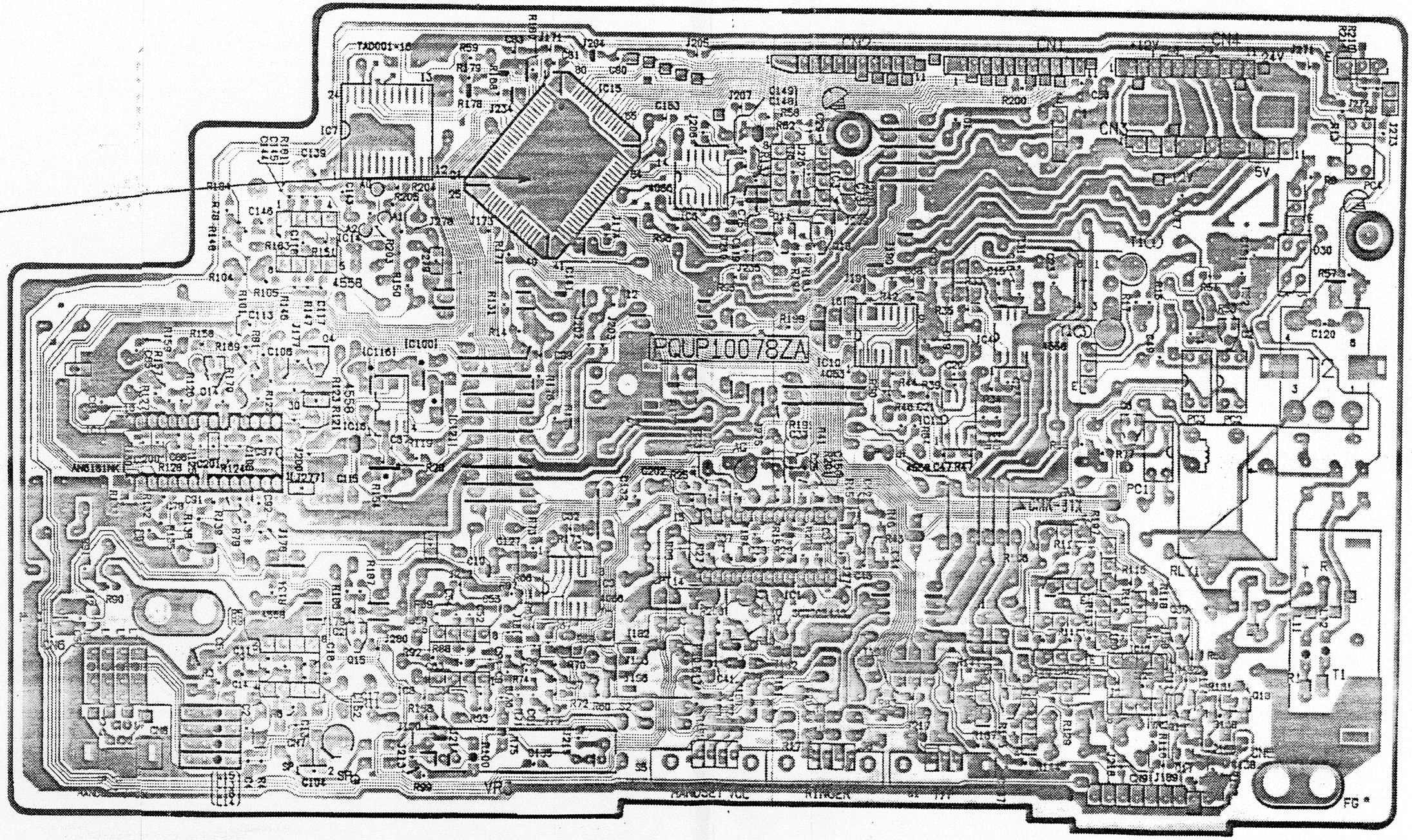
IC15

Pin No.	Voltage	Pin No.	Voltage & Waveform
1–4	0 V	29	5 V
6		33	
10–13		35	
16, 17		44	
20–26		46	
28, 30		54	
34		73	
36–43		65–72	5 V / 0 V
45		74–80	
48–53			
56			
58–64			
5	5 V		
7			
9			
14, 15			
18, 19			
27			



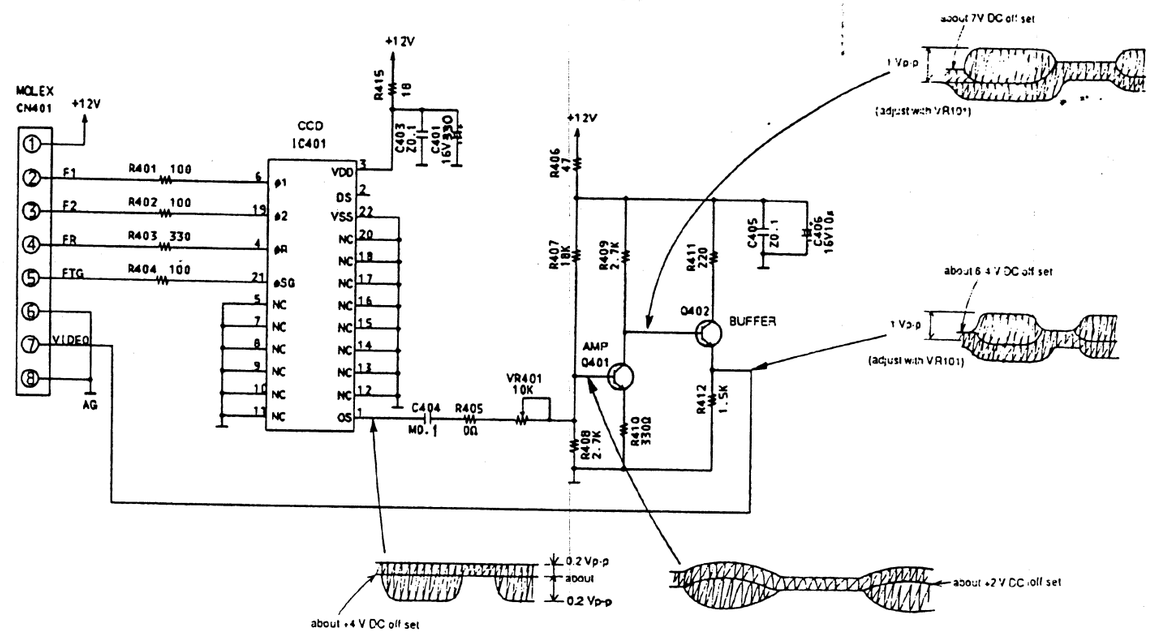
PRINTED CIRCUIT BOARD (ANALOG BOARD)

(BOTTOM VIEW)

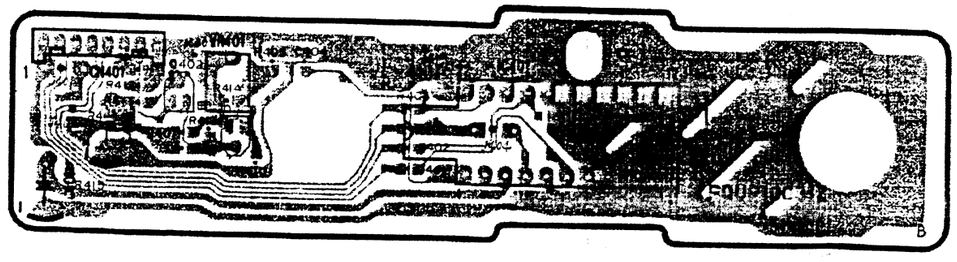


SCHEMATIC DIAGRAM AND PRINTED CIRCUIT BOARD

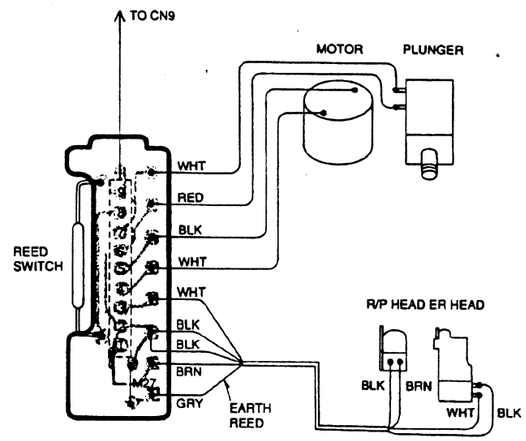
CCD CIRCUIT

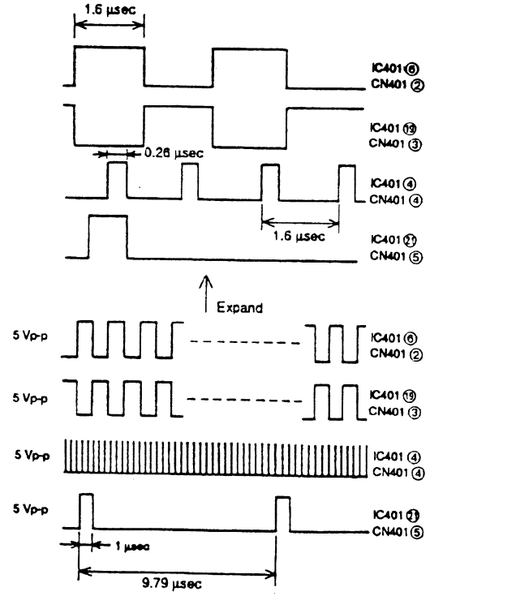


CCD BOARD (COMPONENT VIEW)



CASSETTE DECK BOARD (COMPONENT VIEW)

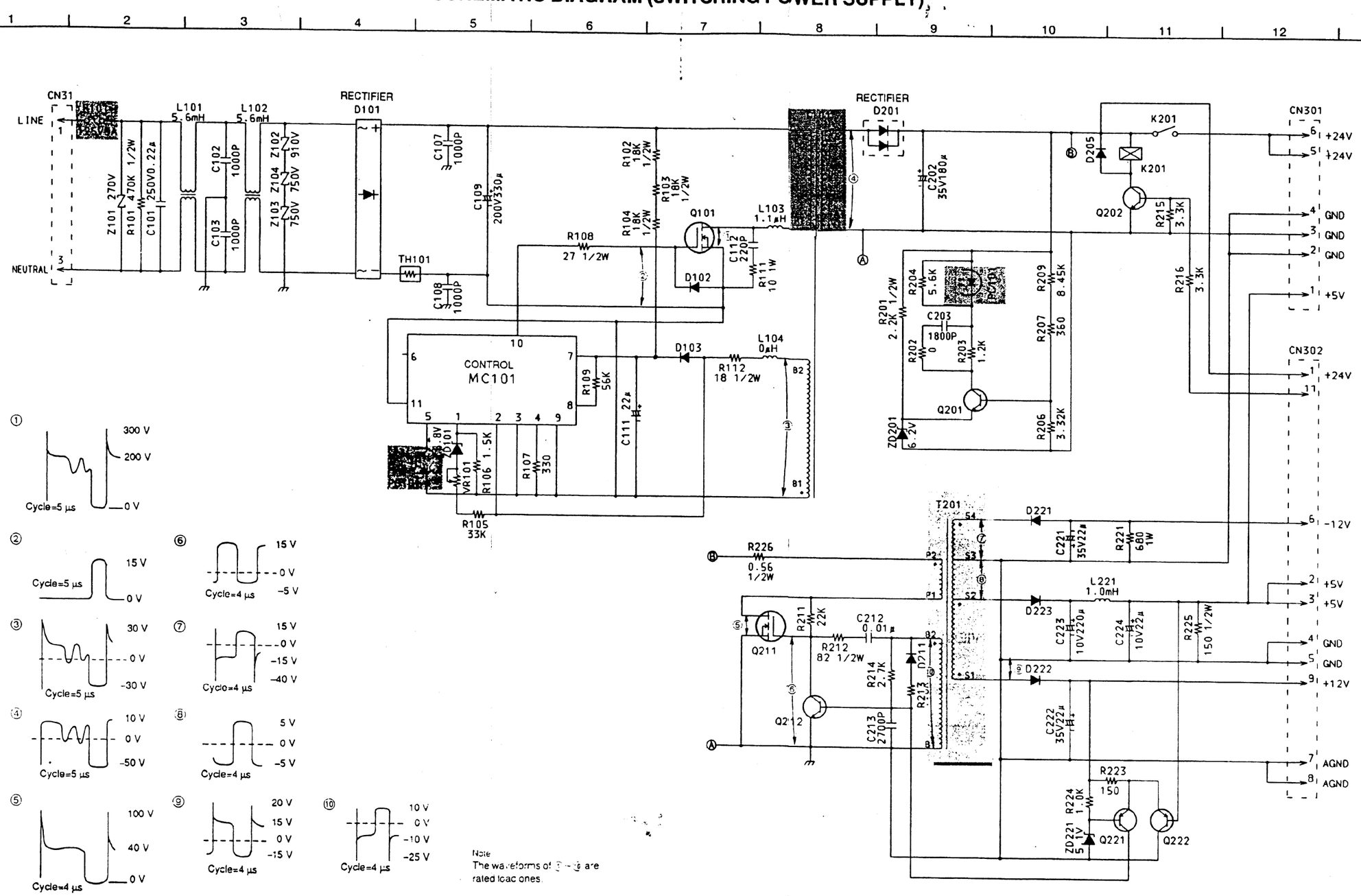




Notes:

1. The circuit shown in ▨ on the conductor indicates printed circuit on the back side of the printed circuit board.
2. The circuit shown in □ on the conductor indicates printed circuit on the front side of the printed circuit board.

SCHEMATIC DIAGRAM (SWITCHING POWER SUPPLY)

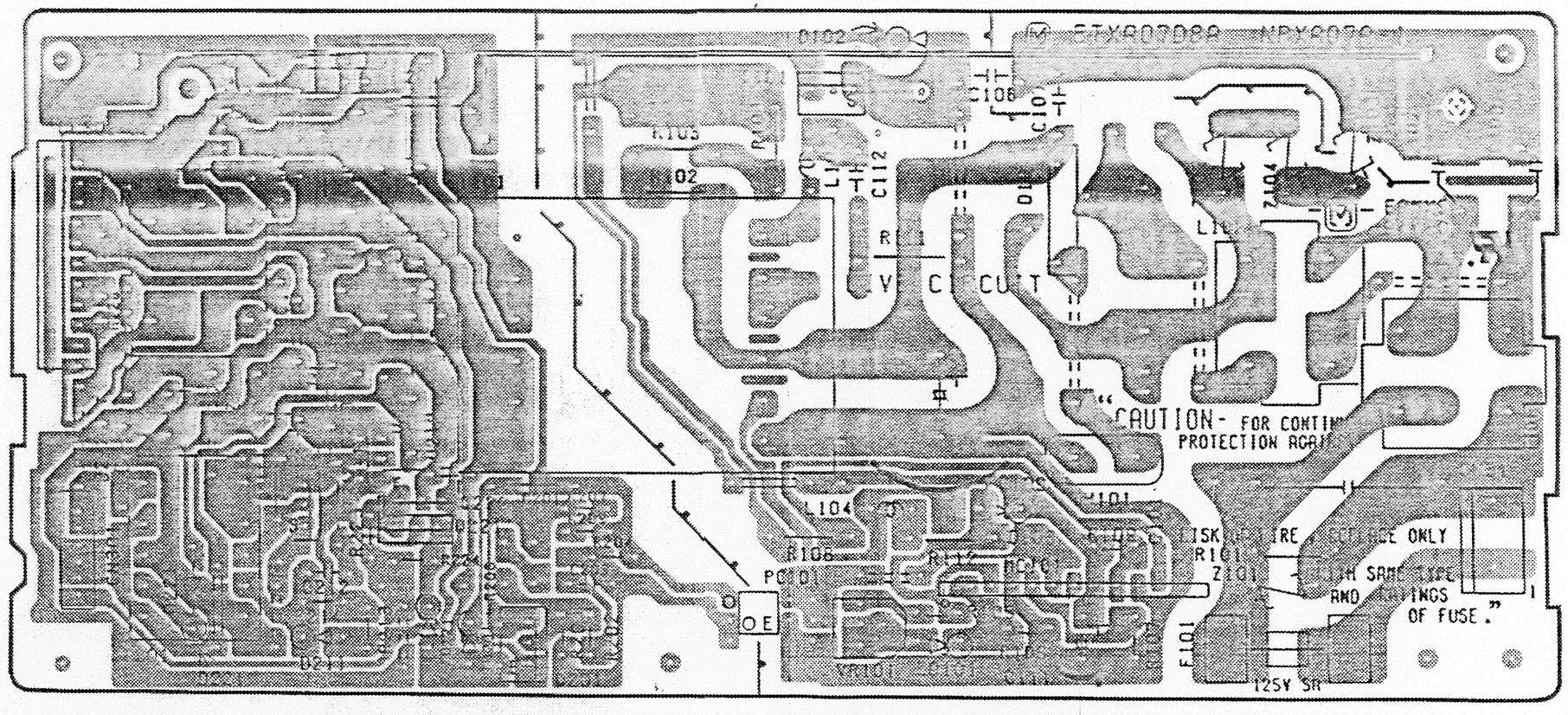


Note
The waveforms of ③ - ⑩ are rated load ones.

Note:
When measuring the waveform on the primary circuit of the Switching Power Supply Board, be sure to insulate the ground of the oscilloscope's probe from the ground of its power supply.

PRINTED CIRCUIT BOARD (SWITCHING POWER SUPPLY)

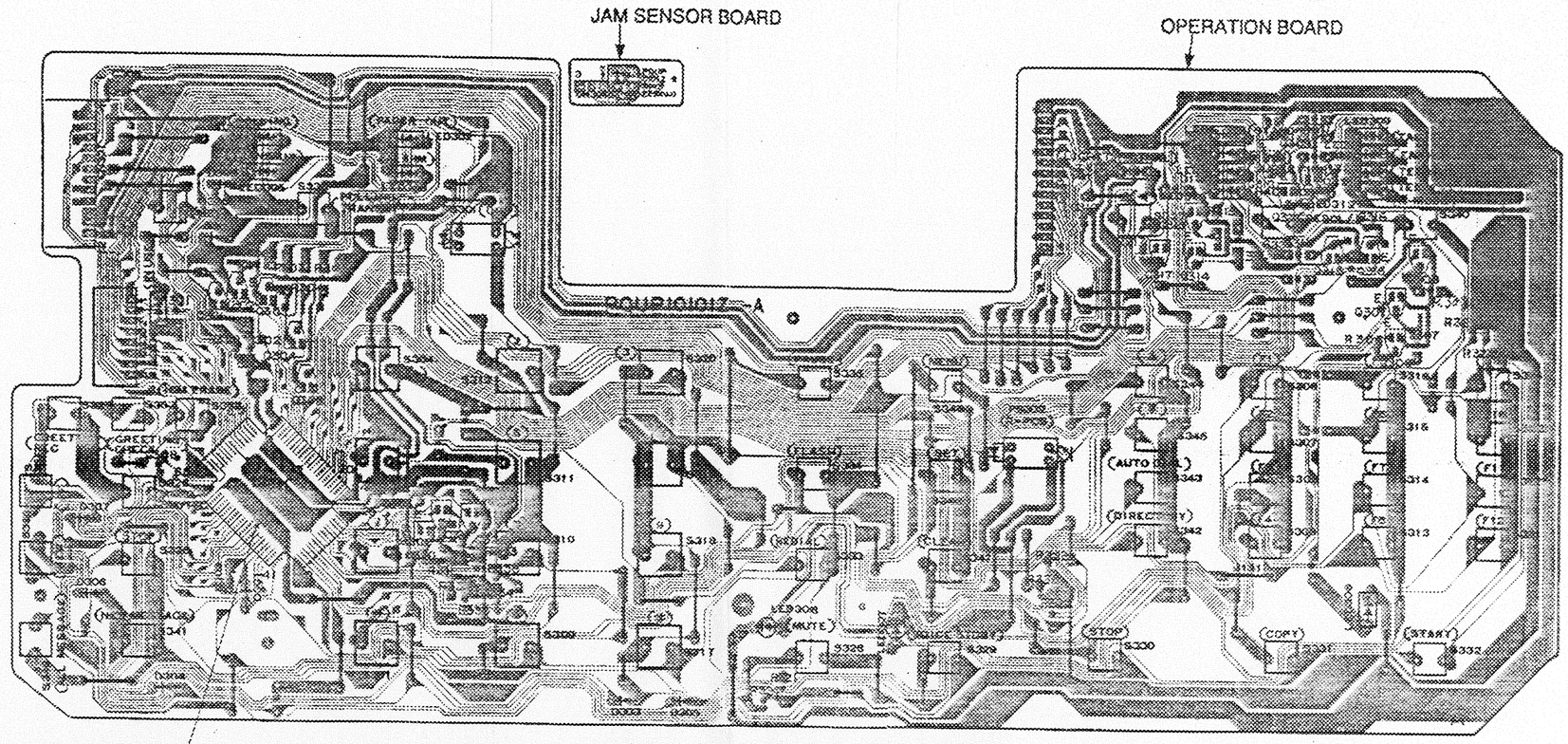
(COMPONENT VIEW)



PRINTED CIRCUIT BOARD (OPERATION BOARD)

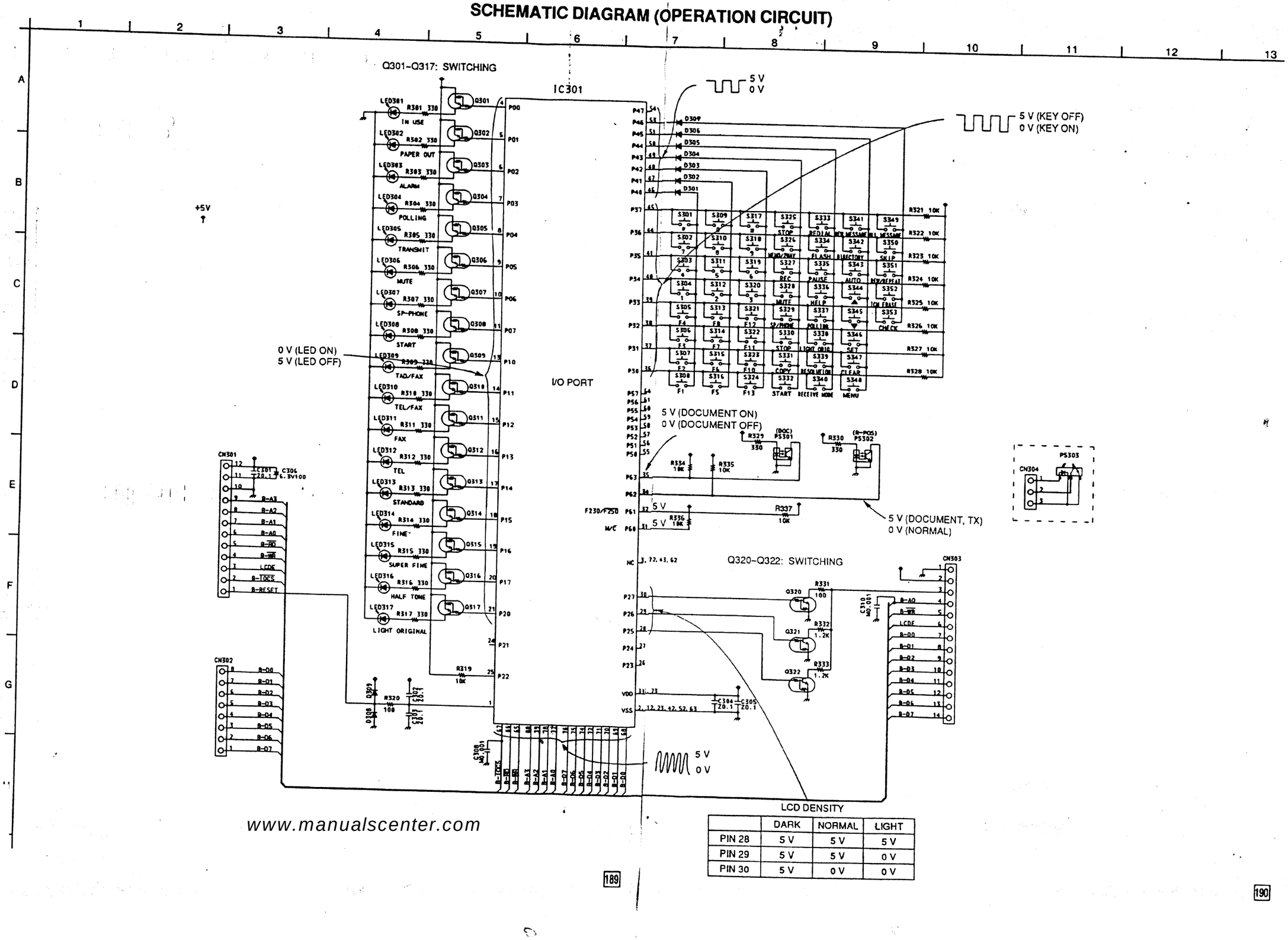
1 2 3 4 5 6 7 8 9 10 11 12 13

(COMPONENT VIEW)



Pin No.	4–11	13–21	28–30				34	35	36–41	44, 45	46–51	53, 54	65–72	74–80
Waveform	0 V (LED ON) 5 V (LED OFF)		LCD Density				5 V (DOC, TX) 0 V (NORMAL)	5 V (DOC ON) 0 V (DOC OFF)	5 V (KEY OFF) 0 V (KEY ON)		5 V 0 V		5 V 0 V	
				DARK	NORMAL	LIGHT								
			Pin 28	5 V	5 V	5 V								
			Pin 29	5 V	5 V	0 V								
			Pin 30	5 V	0 V	0 V								

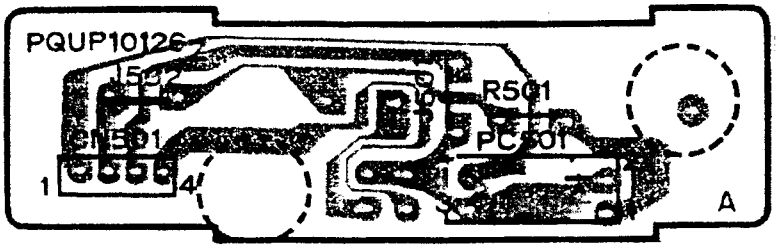
SCHEMATIC DIAGRAM (OPERATION CIRCUIT)



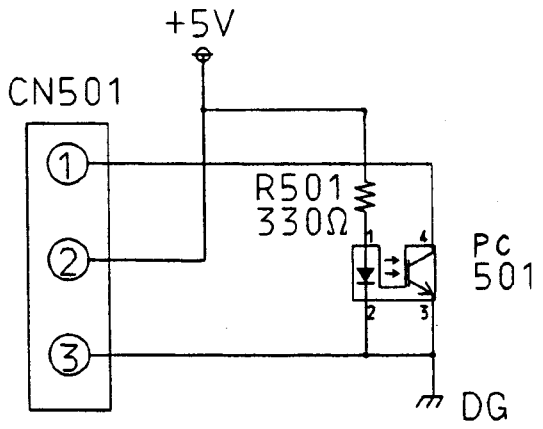
	DARK	NORMAL	LIGHT
PIN 28	5 V	5 V	5 V
PIN 29	5 V	5 V	0 V
PIN 30	5 V	0 V	0 V

PRINTED CIRCUIT BOARD (RECORDING PAPER SENSOR BOARD)

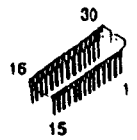
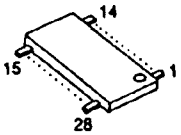
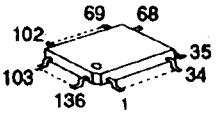
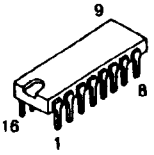
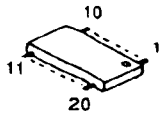
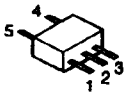
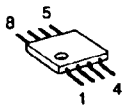
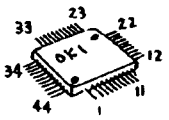
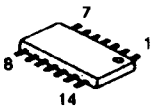
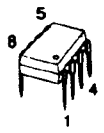
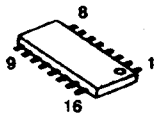
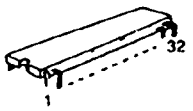
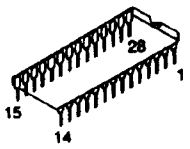
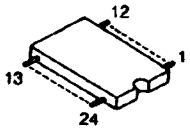
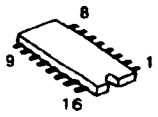
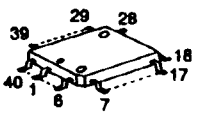
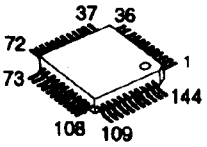
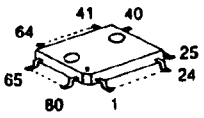
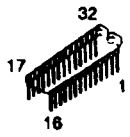
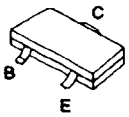
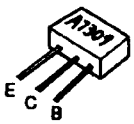
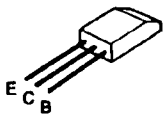
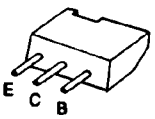
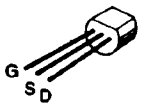
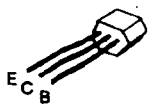
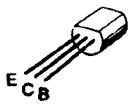
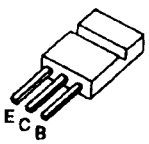
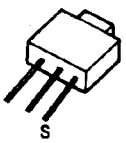
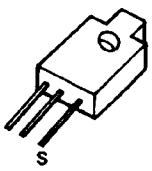
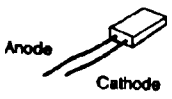
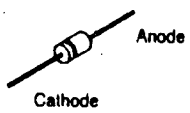
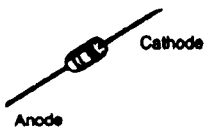
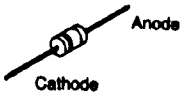
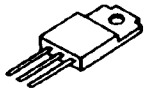
(COMPONENT VIEW)

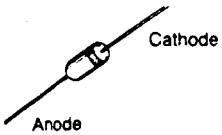
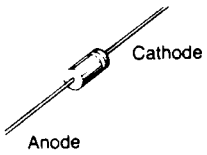
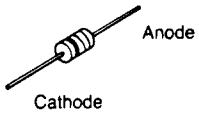
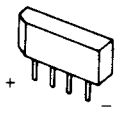
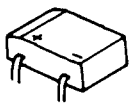
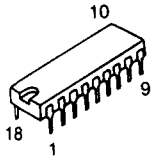


SCHEMATIC DIAGRAM (RECORDING PAPER SENSOR CIRCUIT)

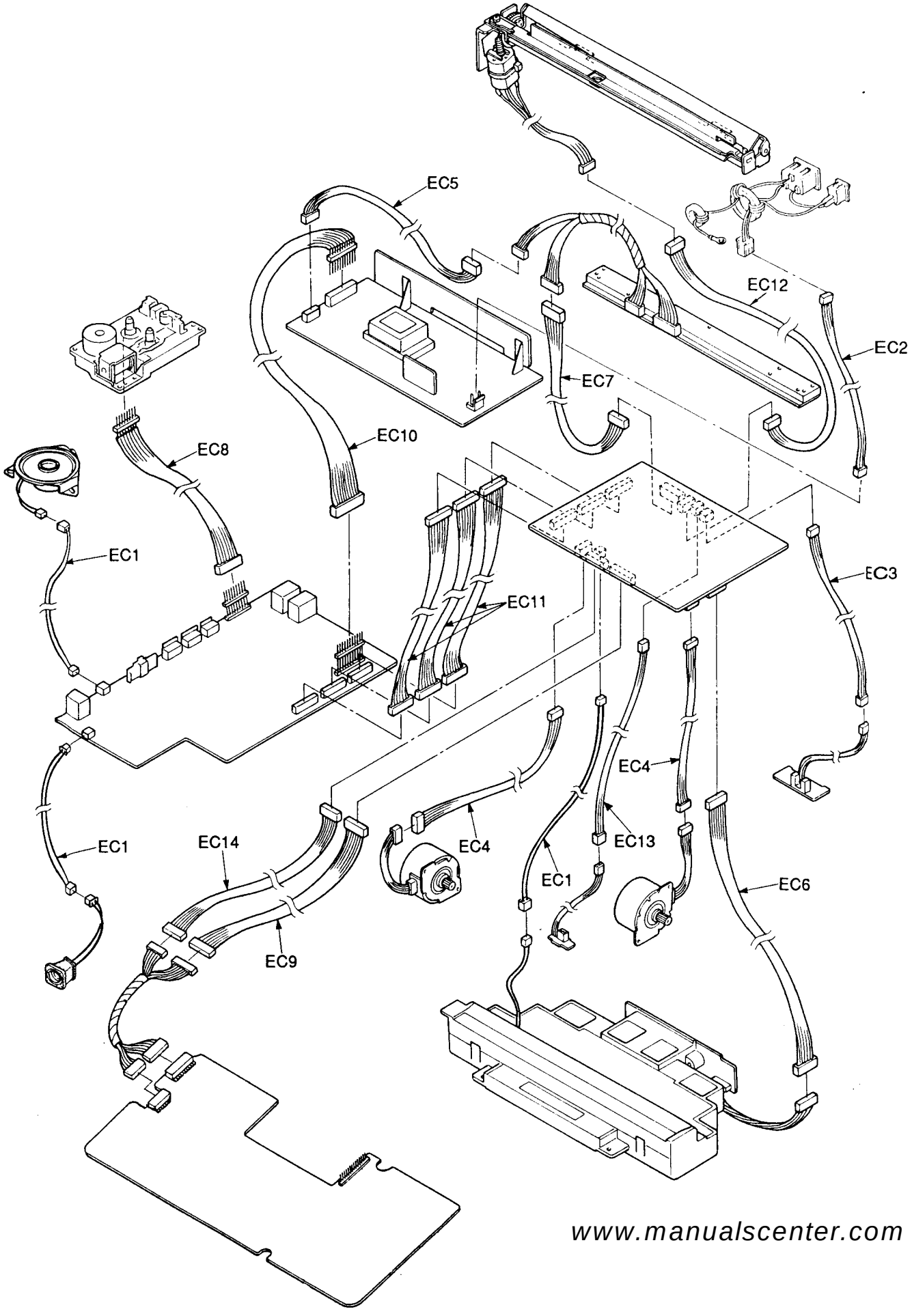


TERMINAL GUIDE OF IC'S, TRANSISTORS AND DIODES

 AN6181NK	 PQVICX58257CL	 RQVIE58R72F	 PQVIBA12003	 PQVIMT3274AE PQVIBA6220
 RQVIPD7H245G PQVISN7H244S PQVILC89066M	 PQVITC7S00FL	 PQVINJM4558M PQVINJM082BM PQVIMM1045BF	 PQVIMS8C5A2G	 PQVITC4066BF PQVINJM2901M PQVIM7H04F
 PQVINJM4558D	 PQVINJ4053BM	 PQVIR96DFX	 PQVISC79054A	 PQVITAD001M1
 PQVITC4053BF	 PQVIZ8400L8V	 PQVIHD66702A	 PQVI672191F	 PQWIF230M
 PQVTDTC114EU 2SB1218A, 2SD1819A PQVTDTC143E PQVTDTA114YU	 2SA1309	 2SA1627	 2SD1994A, 2SB1240AR 2SB1322, 2SC1652	 2SC1318
 2SC1740S, 2SC3311	 2SC2235	 2SD2136	 2SK1060	 2SK1102
 LN342GPX LN242RP	 PQVDHZS3A1 MA165	 MA4062, MA4068 MA4051, MA4056	 1SS147, MA4270 MA4150, MA7200	 MA649

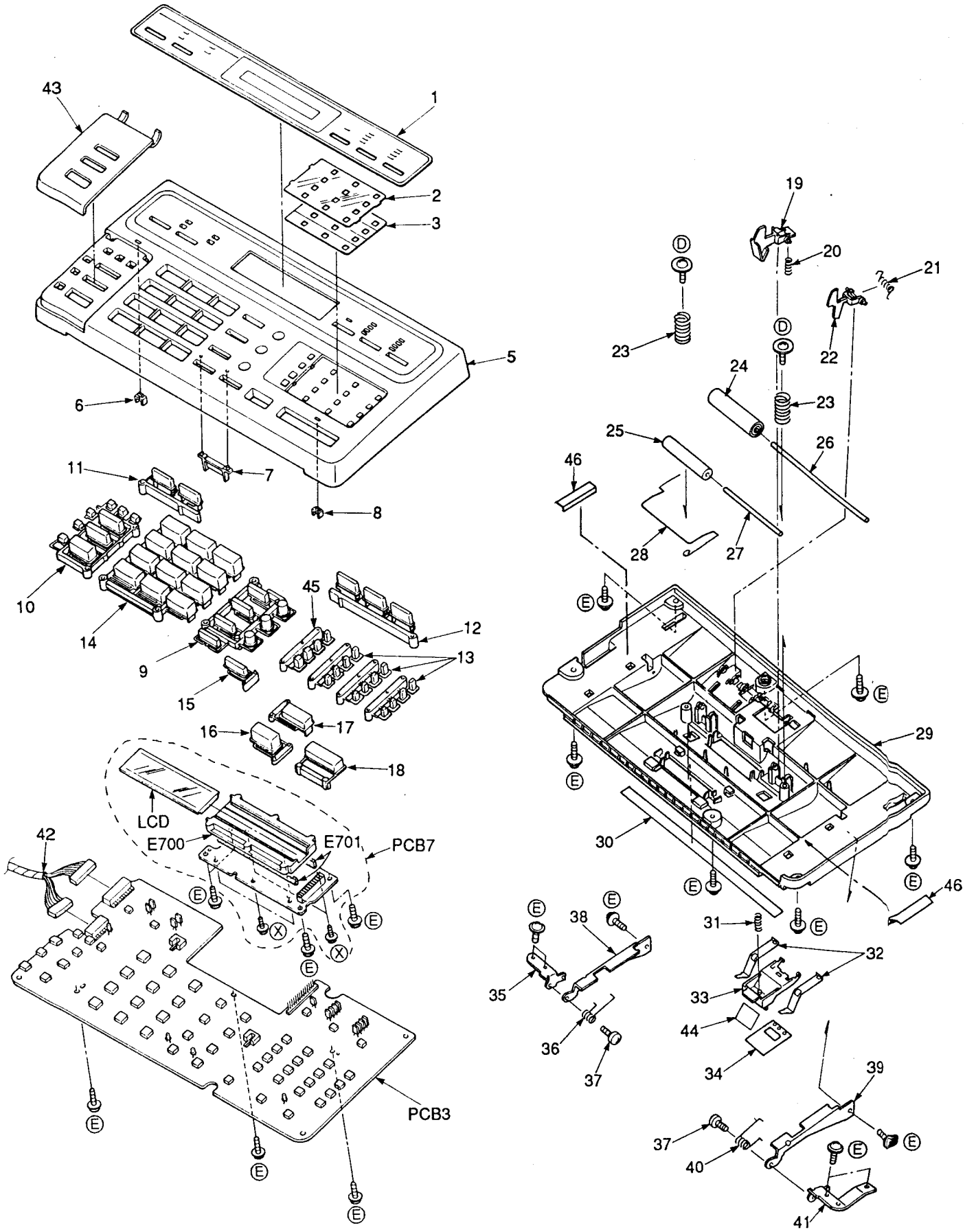
 PQVD1SR354A 1SS120, 1SS131 MA700A	 PQVDERA81004 PQVDAL01Z	 PQVDHZS2B1	 PQVDSLZ281B1 PQVDSLZ181B1	 PQVDS1YB40F1
 PQVIMS6242BS				

CONNECTOR LEAD AND EXTENSION CORD CONNECTING METHOD

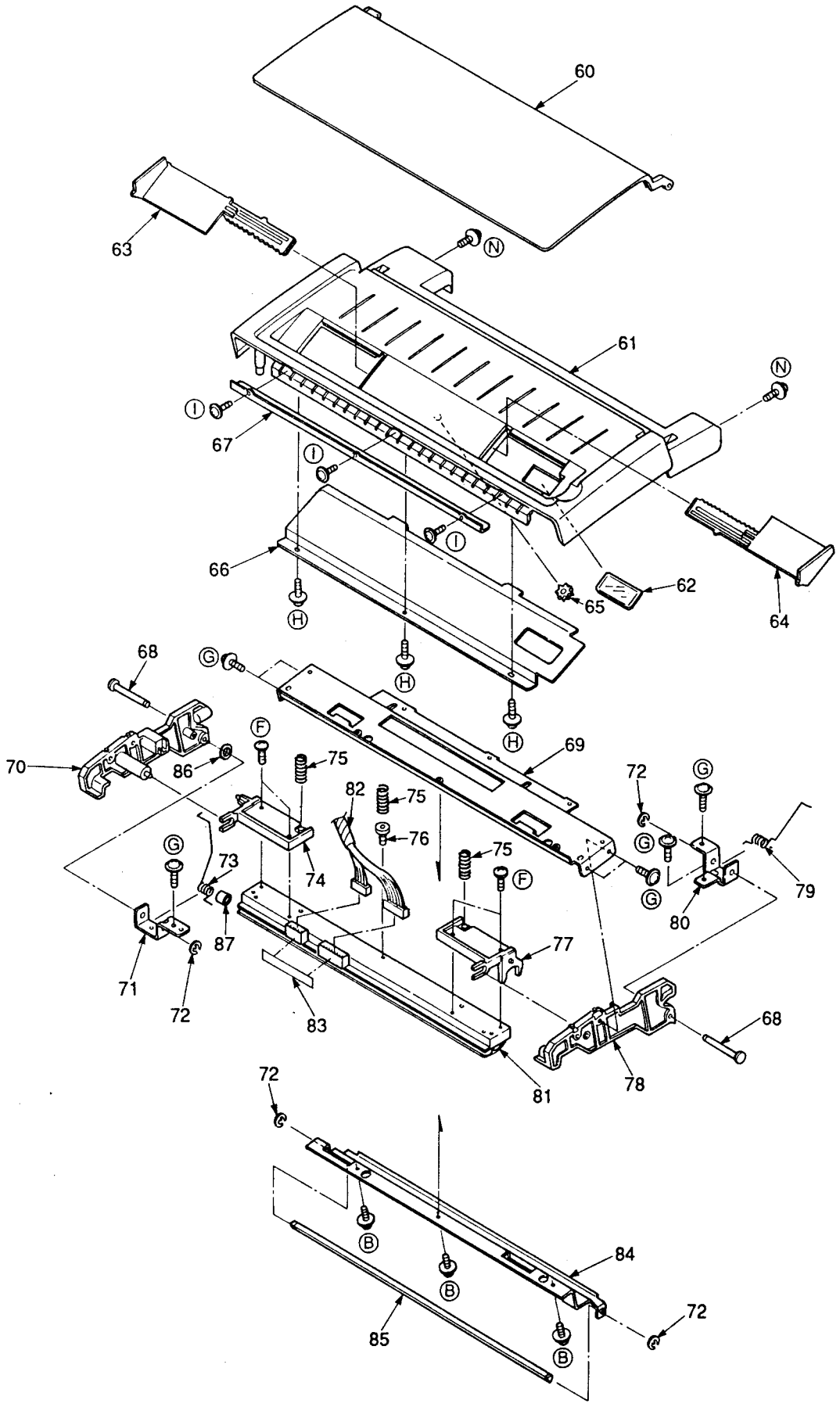


CABINET, MECHANICAL AND ELECTRICAL PARTS LOCATION

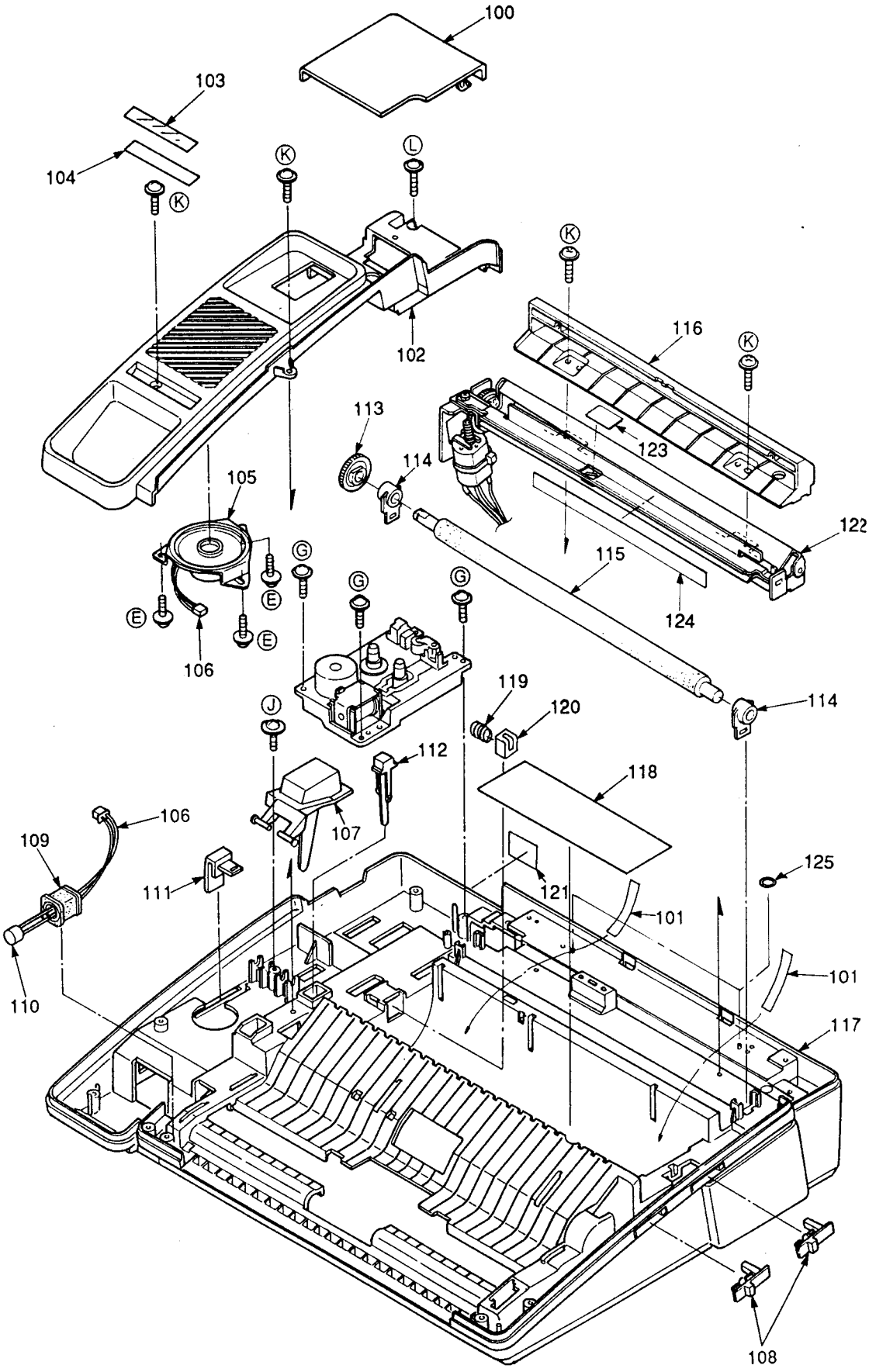
1. OPERATION PANEL SECTION



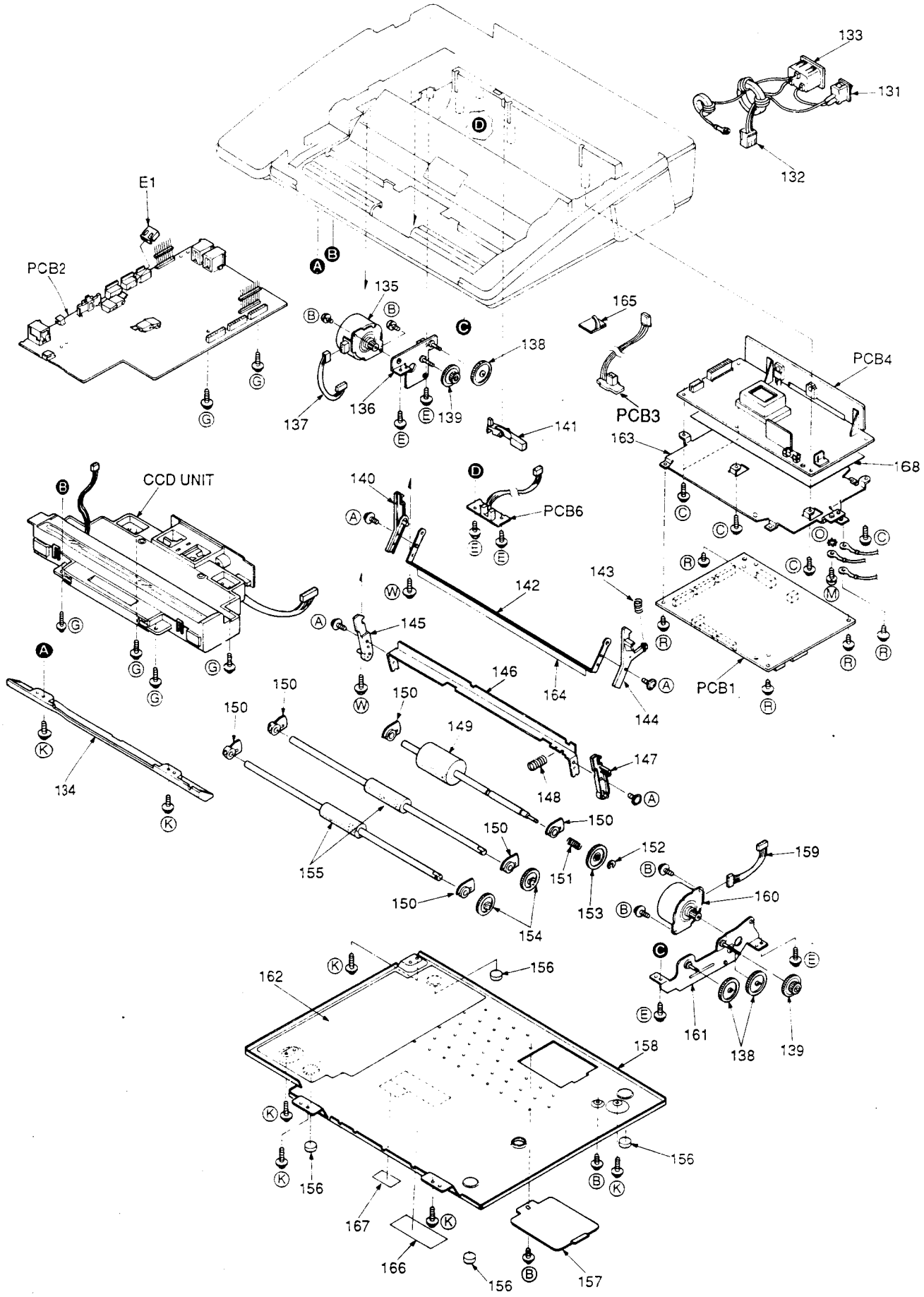
2. THERMAL HEAD SECTION



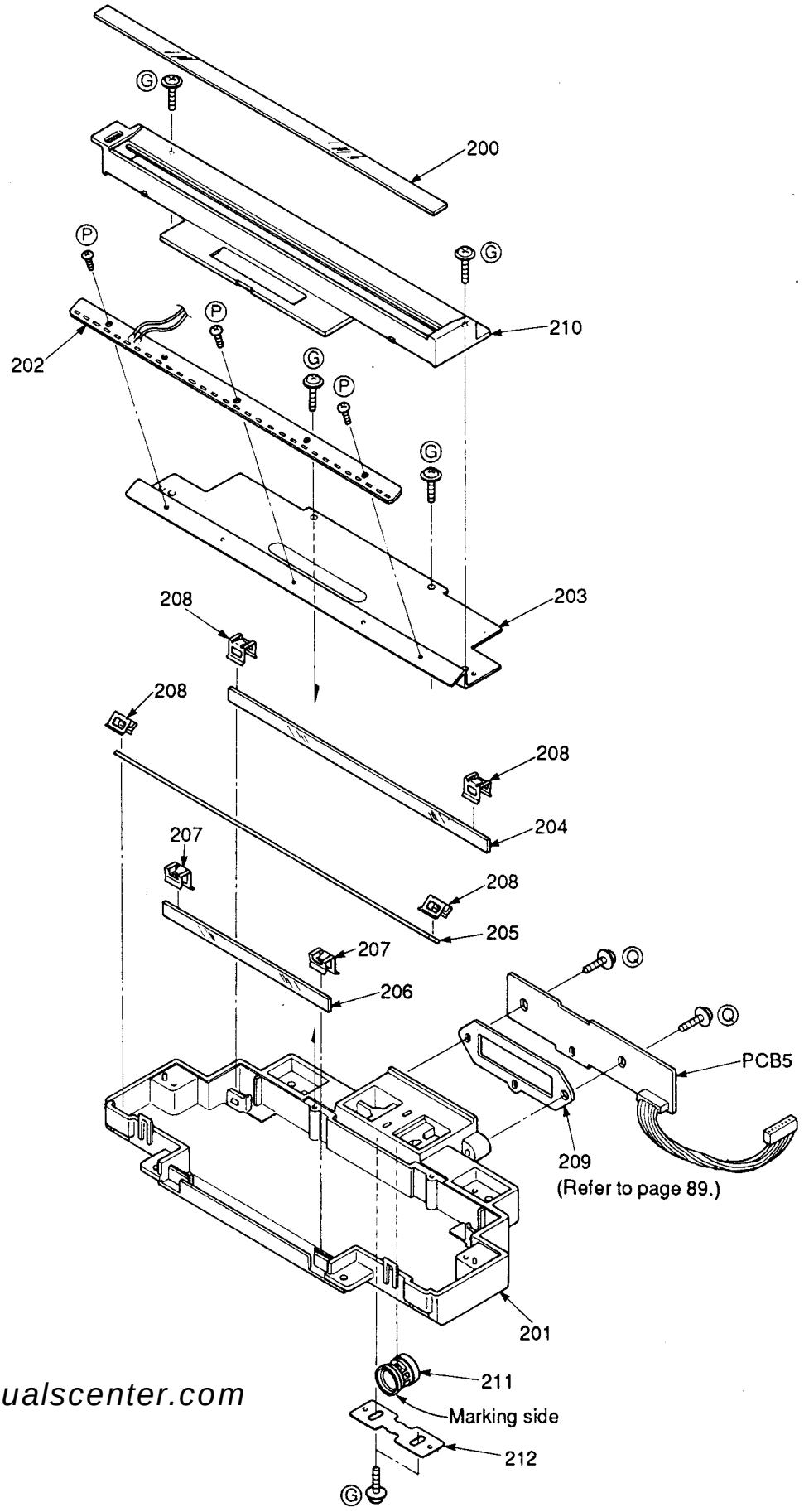
3. UPPER BODY SECTION



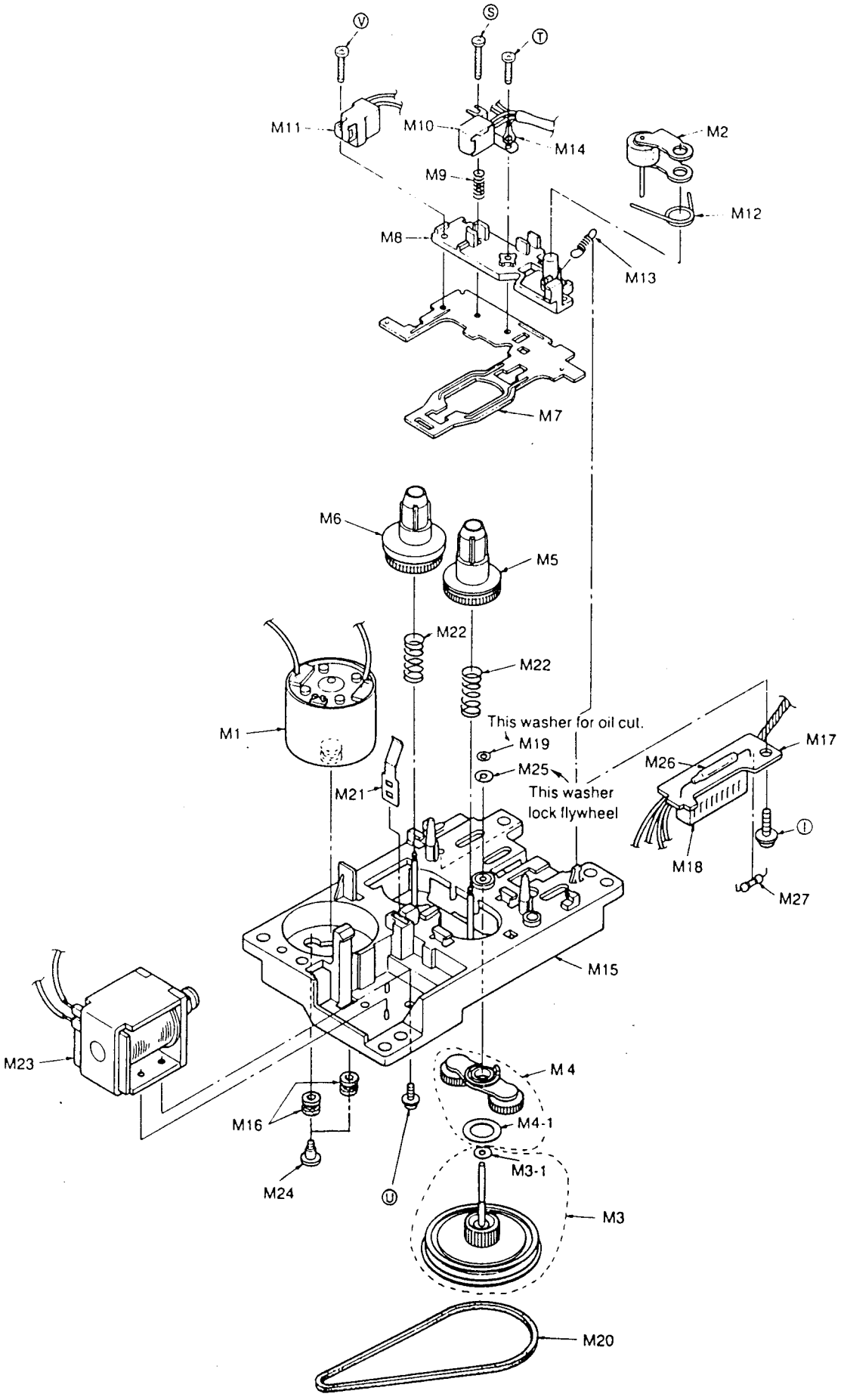
4. LOWER BODY SECTION



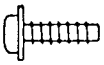
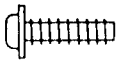
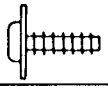
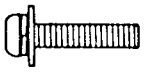
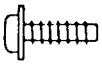
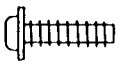
5. CCD UNIT SECTION



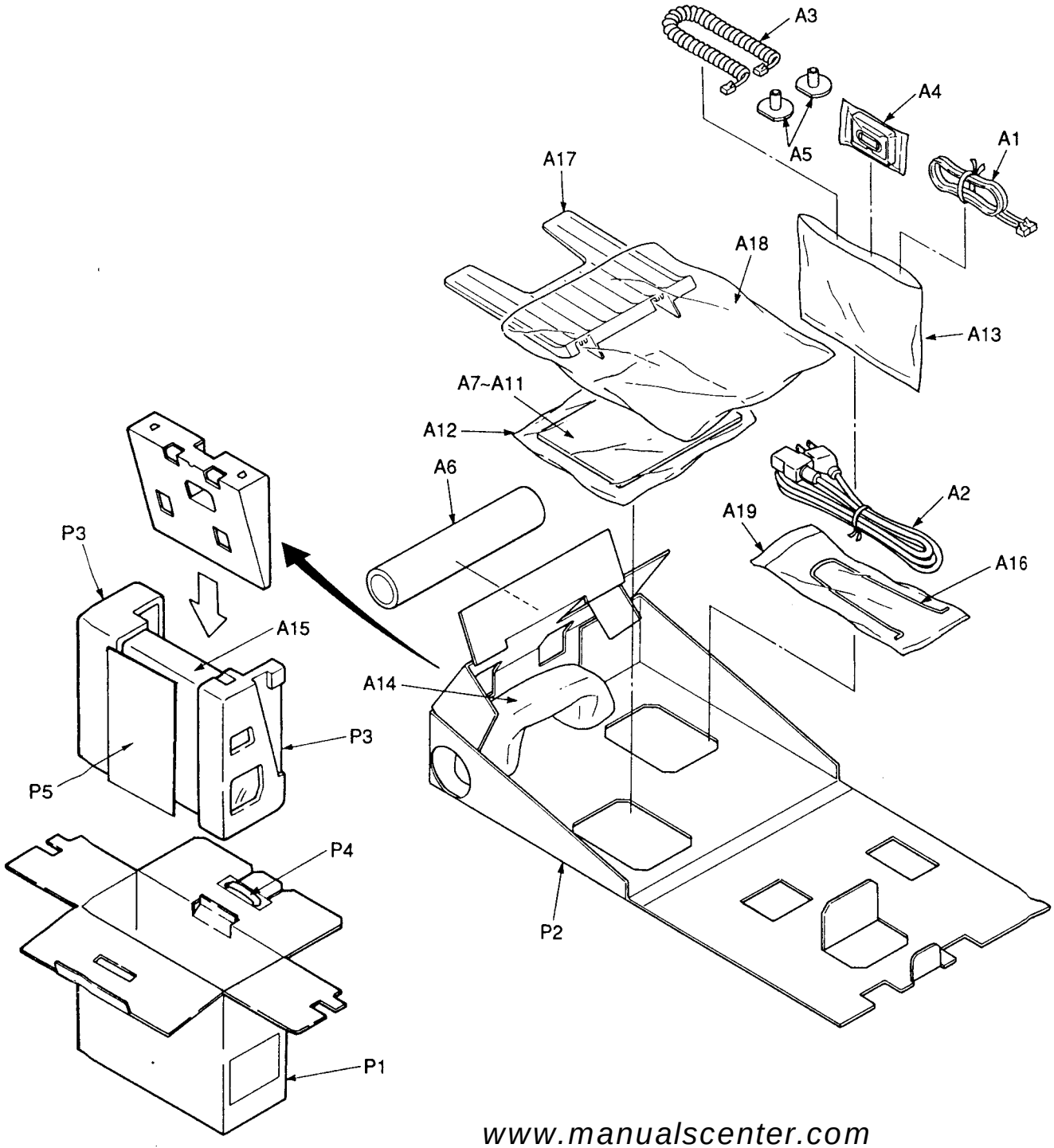
6. CASSETTE DECK SECTION



7. ACTUAL SIZE OF SCREWS AND WASHER

Ref. No.	Part No.	Figure	Ref. No.	Part No.	Figure
Ⓐ	XTW3+6L		Ⓜ	XSB4+6	
Ⓑ	XYC3+CF6		Ⓝ	XTW3+S10PFZ	
Ⓒ	XTW3+CS12P		Ⓞ	XWC4B	
Ⓓ	XTW3+W10P		Ⓟ	XTN26+4F	
Ⓔ	XTW3+S8M		Ⓠ	XYN3+F16	
Ⓕ	XYN3+F8		Ⓡ	XYC3+FF8C	
Ⓖ	XTW3+S10P		Ⓢ	XSN17+10FN-3	
Ⓗ	XTW3+S6P		Ⓣ	XSN17+6FZ-3	
Ⓘ	XTW26+6F		Ⓤ	XTW26+5LF	
Ⓙ	XTW3+W8P		Ⓥ	XSN17+7FN-3	
Ⓚ	XTW3+S12P		Ⓦ	PJHE5065Z	
Ⓛ	XTW3+S20P		Ⓧ	XTW23+S6F	

ACCESSORIES AND PACKING MATERIALS



This replacement parts list is for U.S.A. version only. Refer to the simplified manual (cover) for other areas.

REPLACEMENT PARTS LIST

Model KX-F230

Notes:

1. RTL (Retention Time Limited)
   The marking (RTL) indicates that the Retention Time is limited for this item. After the discontinuation of this assembly in production, the item will continue to be available for a specific period of time. The retention period of availability is dependant on the type of assembly, and in accordance with the laws governing part and product retention.
   After the end of this period, the assembly will no longer be available.
2. Important safety notice
   Components identified by the ⚠ mark special characteristics important for safety. When replacing any of these components, use only manufacturer's specified parts.
3. The S mark indicates service standard parts and may differ from production parts.
4. RESISTORS & CAPACITORS
   Unless otherwise specified,
   All resistors are in ohms (Ω) K=1000Ω, M=1000KΩ
   All capacitors are in MICRO FARADS (μF) P= μμF
   *Type &Wattage of Resistor

Type

ERC: Solid	ERX: Metal Film	PQ4R: Carbon
ERD: Carbon	ERG: Metal Oxide	ERS: Fusible Resistor
PQRD: Carbon	ER0: Metal Film	ERF: Cement Resistor

Wattage

10, 16: 1/8W	14, 25: 1/4W	12: 1/2W	1: 1W	2: 2W	3: 3W

Type

ECFD: Semi-Conductor	ECCD, ECKD, ECBT, PQCBC: Ceramic
ECQS: Styrol	ECQE, ECQV, ECQG: Polyester
PQCUV: Chip	ECEA, ECSZ: Electrolytic
ECQMS: Mica	ECQP: Polypropylene

Voltage

ECQ Type	ECQG ECQV Type	ECSZ Type	Others	
1H: 50V	05: 50V	0F: 3.15V	0J: 6.3V	1V: 35V
2A: 100V	1: 100V	1A: 10V	1A: 10V	50, 1H: 50V
2E: 250V	2: 200V	1V: 35V	1C: 16V	1J: 63V
2H: 500V		0J: 6.3V	1E, 25: 25V	2A: 100V

Ref. No.	Part No.	Part Name & Description	Pcs
		CABINET, MECHANICAL AND ELECTRICAL PARTS	
		(1. OPERATION PANEL SECTION)	
1	PQGP10029Y	PANEL, LCD	1
2	PQGV10005Z	TRANSPARENT PLATE, TEL. NO. CARD	1
3	PQGD10040Z	CARD, TEL. (LARGE)	1
4	Not Used		
5	PQGG10013Y2	OPERATION PANEL	1
6	PQGP10024Z	LED COVER-A	1
7	PQGP10025Z	LED COVER-B	1
8	PQGP10026Z	LED COVER-C	1
9	PQBX10059Z2	BUTTON, FAX MENU, ITS	1
10	PQBX10060Y2	BUTTON, TAM	1
11	PQBX10066Z2	BUTTON, FAX FUNCTION	1
12	PQBX10065Z2	BUTTON, FAX FUNCTION	1
13	PQBX10041X2	BUTTON, DIALER	3
14	PQBX10058Y2	BUTTON, DIAL	1
15	PQBC10047Z1	BUTTON, SP-PHONE	1
16	PQBC10044Z2	BUTTON, STOP/CLEAR	1
17	PQBC10046Z2	BUTTON, COPY	1
18	PQBC10045Z1	BUTTON, START	1
19	PQDE10010Y	LEVER, READ DETECTION	1
20	PQUS10019Z	SPRING-A, DOCUMENT DETECTION LEVER	1
21	PQUS315Z	SPRING-B, DOCUMENT DETECTION LEVER	1
22	PQDE10009Z	LEVER, DOCUMENT DETECTION	1
23	PQUS10011Z	SPRING, ROLLER	2
24	PQDR9685Z	SUB ROLLER-A	1
25	PQDR16Z	SUB ROLLER-B	1
26	PQDF10004Z	SHAFT-A, SUB ROLLER	1
27	PQDF9057Z	SHAFT-B, SUB ROLLER	1
28	PQUS10022Y	SPRING, SUB ROLLER	1
29	PQUV10002W	COVER, OPERATION PANEL	1
30	PQHX10078Y	READING PLATE	1
31	PQUS10010Z	SPRING, SEPARATION	1
32	PQUS10008Z	SPRING, DOCUMENT FEED	2
33	PQHR10056Z	GUIDE	1
34	PQHG10038Y	SEPARATION RUBBER	1
35	PQMH10017Z	ANGLE-L, PANEL SIDE	1
36	PQUS10015Z	SPRING-L, PANEL OPEN/CLOSE	1
37	PQHD10010Y	SCREW	2
38	PQMH10015Z	ANGLE-L, PANEL OPEN/CLOSE	1
39	PQMH10016Z	ANGLE-R, PANEL OPEN/CLOSE	1
40	PQUS10016Z	SPRING-R, PANEL OPEN/CLOSE	1
41	PQMH10018Z	ANGLE-R, PANEL SIDE	1
42	PQJS20R83Z	CONNECTOR, 20P	1
43	PQKK10015X2	LID, TAM	1
44	PQHX10194Z	SHEET	1
45	PQBX10062Y2	BUTTON, DIRECTORY	1
46	PQHX10193Z	SHEET	2
		(2. THERMAL HEAD SECTION)	
60	PQKE10007Y2	TRAY	1
61	PQKV10013Z2	COVER, RECORDING PAPER	1
62	PQGP10014Z	PANEL, RECORDING PAPER	1
63	PQKR10001Z2	GUIDE-L, DOCUMENT	1
64	PQKR10002Z2	GUIDE-R, DOCUMENT	1
65	PQDG10007Z	GEAR, DOCUMENT GUIDE	1
66	PQMD10007Y	ANGLE-A, RECORDING PAPER COVER	1
67	PQMD10010Z	ANGLE-B, RECORDING PAPER COVER	1
68	PQDF10008Z	SHAFT, ARM	2
69	PQMD10008Z	FRAME, RECORDING PAPER COVER	1
70	PQHR10054Z	ARM-L	1
71	PQMH10013Z	ANGLE-L	1
72	XUC25FY	RETAINING RING	4
73	PQUS10012Z	SPRING-L, ANGLE-L	1
74	PQDE10005Z	GUIDE-L, THERMAL HEAD	1
75	PQUS10009Z	SPRING, THERMAL HEAD	3
76	PQHD10012Z	SCREW	1
77	PQDE10006Z	GUIDE-R, THERMAL HEAD	1
78	PQHR10055Z	ARM-R	1
79	PQUS10013Y	SPRING-R, ANGLE-R	1
80	PQMH10014Z	ANGLE-R	1
81	PQJHS0002Z	THERMAL HEAD S	1
82	PQJS15R78X	CONNECTOR, 15P	1
83	PQHX10080Z	INSULATOR SHEET-A	1
84	PQMD10009Z	FRAME, THERMAL HEAD	1
85	PQDF10003Z	SHAFT	1
86	PQMH10044Z	SPACER	1
87	PQMH10045Z	SPACER	1
		(3. UPPER BODY SECTION)	
100	PQKK10010Z2	CASSETTE LID	1
101	PQHX10092Z	SHEET	2
102	PQKM10035Z2	CABINET BODY, HANDSET	1
103	PQHR576Z	TRANSPARENT PLATE, TEL. CARD	1
104	PQHP532X	CARD, TEL. (SMALL)	1
105	PQAS5P13Z	SPEAKER	1
106	PQJS02R70Z	CONNECTOR, 2P	2
107	PQBH10006Y2	BUTTON, HOOK	1
108	PQBD10015Y2	KNOB, OPEN	2
109	PQHG556Z	RUBBER PARTS, MIC COVER	1
110	PQJM128Z	BUILTIN-MICROPHONE	1
111	PQBD10014Z3	KNOB, VOLUME	1
112	PQDE10007Z	LEVER, OPEN/CLOSE SENSOR	1
113	PQDG10004Z	GEAR, RECORDING ROLLER	1
114	PQDJ10001Z	SPACER, ROLLER	2
115	PQDN10001Z	ROLLER, RECORDING PAPER	1
116	PQKR10004Z2	GUIDE, RECORDING PAPER	1
117	PQKM10034W2	CABINET BODY	1
118	PQQT10383Z	INDICATION LABEL	1
119	PQUS10027Z	SPRING, BACK TENSION	1
120	PQHR10066Z	SPACER	1

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Ref. No.	Part No.	Part Name & Description	Pcs
121	PQHX10155Z	SHEET, EXT. TEL. JACK	1
122	PQDX10005Y	PAPER CUTTER ASS'Y	1
123	PQHX10208Z	SHEET, PAPER CUTTER	1
124	PQQT4337Z	CAUTION LABEL	1
125	PQNW500U	WASHER	2
		(4. LOWER BODY SECTION)	
131	PQST1A05Z	SWITCH, POWER ⚠	1
132	PQJS2L94Z	CONNECTOR, 2P	1
133	PQJP03S07Z	AC INLET ⚠	1
134	PQKV10008Z2	COVER, FRONT	1
135	PQJQ10005Z	RX MOTOR	1
136	PQUA10002Z	CHASSIS-J, GEAR	1
137	PQJS05R66Z	CONNECTOR, 5P	1
138	PQDG10003Z	GEAR-B, MIDDLE	3
139	PQDG10002Z	GEAR-A, MIDDLE	2
140	PQDE10001Z	LEVER-JL	1
141	PQDE10008Z	LEVER, RECORDING PAPER SENSOR	1
142	PQMD10005Z	ANGLE-J	1
143	PQUS10017Z	SPRING-J	1
144	PQDE10002Z	LEVER-JR	1
145	PQDE10003Z	LEVER-SL	1
146	PQMD10006Y	ANGLE-S	1
147	PQDE10004Z	LEVER-SR	1
148	PQUS10018Z	SPRING-S	1
149	PQDN10002Z	ROLLER, SEPARATION	1
150	PQDJ10002Z	SPACER, ROLLER	6
151	PQUS10014Z	SPRING, SEPARATION ROLLER	1
152	XUC2FY	RETAINING RING	1
153	PQDG10006Z	GEAR, SEPARATION ROLLER	1
154	PQDG10005Z	GEAR, FEED ROLLER	2
155	PQDN10003Z	ROLLER, DOCUMENT FEED	2
156	PQHG10065Z	RUBBER FOOT	4
157	PQHM171Z	LID, ROM CHANGE	1
158	PQMD10012Y	FRAME, BOTTOM	1
159	PQJS05R67Z	CONNECTOR, 5P	1
160	PQJQ10004Z	TX MOTOR	1
161	PQUA10001Z	CHASSIS-S, GEAR	1
162	PQHX10081X	INSULATOR SHEET-B	1
163	PQMD10011Y	CHASSIS, POWER SUPPLY BOARD	1
164	PQHR10139Z	COVER	1
165	PQHR136Z	CLAMPER	4
166	PQQT10155Z	CAUTION LABEL, FCC	1
167	PQQT10072Z	CAUTION LABEL, PATENT	1
168	PQHX10082Y	INSULATOR SHEET-C	1
		(5. CCD UNIT SECTION)	
200	PQ0G10001Z	GLASS	1
201	PQUA10003Z	CHASSIS	1
202	PQVDKMK02A30	LED ARRAY	1
203	PQMD10013Z	ANGLE	1
204	PQ0M10002Z	MIRROR-2	1
205	PQ0M10001Z	MIRROR-1	1
206	PQ0M10003Z	MIRROR-3	1
207	PQUS272Z	SPRING-B, MIRROR	2
208	PQUS216Z	SPRING-A, MIRROR	4
209	PQHR9725Z	SPACER	1
210	PQUV10003Z	COVER	1
211	PQ0L6Y	LENS	1
212	PQUS217Z	SPRING, LENS	1
		(6. CASSETTE DECK SECTION)	
M1	PQFM9909Z	MOTOR ASS'Y	1
M2	PQFD9913Z	PINCH ROLLER ASS'Y	1
M3	PQFF9909Y	FLYWHEEL ASS'Y	1
M3-1	PQFN35Z	WASHER-C	1
M4	PQFG9904Z	GEAR ASS'Y	1
M4-1	PQFN48Z	WASHER-D	1
M5	PQFR9912Z	TAKEUP REEL TABLE ASS'Y	1
M6	PQFR9913Z	SUPPLY REEL TABLE ASS'Y	1

Ref. No.	Part No.	Part Name & Description	Pcs
M7	PQFD82Y	HEAD BASE PLATE	1
M8	PQFW42Y	HEAD BASE	1
M9	PQFS73Z	SPRING, RECORD/PLAYBACK HEAD	1
M10	PQJH1M2X	HEAD, RECORD/PLAYBACK	1
M11	PQJH6M2Z	HEAD, ERASE	1
M12	PQFS109Z	SPRING, PINCH ROLLER	1
M13	PQFS110Z	SPRING, HEAD PLATE	1
M14	PQFJ2Z	TERMINAL	1
M15	PQFC9909W	CHASSIS ASS'Y	1
M16	PQFI14Z	RUBBER PARTS, MOTOR SPACER	2
M17	PQUP589Y	P. C. BOARD, REED SWITCH	1
M18	PQJS9B30Z	CONNECTOR, 9P	1
M19	PQFN33Z	WASHER (FOR OIL CUT)	2
M20	PQFB12Z	BELT	1
M21	PQFD64Z	PLATE SPRING	1
M22	PQFS82Z	SPRING, REEL TABLE	2
M23	PQFP126Y	PLUNGER	1
M24	PQHD15Z	SCREW	2
M25	PQFN49Z	WASHER (FOR LOCK OF FLYWHEEL)	1
M26	PQSE91Z	REED SWITCH	1
M27	ERDS2TJ563	RESISTOR, 56KΩ	1
		ACCESSORIES AND PACKING MATERIALS	
A1	PQJA59V	CORD, TEL. ⚠S	1
A2	PQJA200Z	CORD, AC ⚠	1
A3	PQJA212N	CORD, HANDSET	1
A4	RT-N30-JT1P	MICRO CASETTE TAPE	1
A5	PQDJ10003Z	SPACER, RECORDING PAPER	2
A6	PQHP10023Z	RECORDING PAPER	1
A7	PQQX10279Z	INSTRUCTION BOOK	1
A8	PQQW10218Z	INSTRUCTION BOOK (QUICK REFERENCE) (ENGLISH)	1
A9	PQQW10219Z	INSTRUCTION BOOK (QUICK REFERENCE) (SPANISH)	1
A10	PQQW10282Z	FAX CORRESPONDENCE SHEET	1
A11	PQQW10110Z	CARD, DIAL	1
A12	PQPP10005Z	PROTECTION COVER (DOCUMENT)	1
A13	XZB20X20A04	PROTECTION COVER (CORD)	1
A14	PQJX2PFA409Z	HANDSET	1
A15	PQPH92Z	PROTECTION COVER (UNIT)	1
A16	PQUS230X	SPRING	1
A17	PQKE10008Z2	STACKER	1
A18	PQPH106Z	PROTECTION COVER (STACKER)	1
A19	XZB10X28A04	PROTECTION COVER (SPRING)	1
P1	PQPK10204X	GIFT BOX	1
P2	PQPN10102Z	ACCESSORY BOX	1
P3	PQPN10118Y	CUSHION-L/R (COMPLETE)	1
P4	PQPN935Z	HANDLE	1
P5	PQPN10182Z	PAD	1
		DIGITAL BOARD PARTS	
PCB1	PQWP1F230M	DIGITAL BOARD ASS'Y (RTL)	1
		(ICs)	
IC1	PQVIZ8400L8V	IC	1
IC2	PQWIF230M	IC	1
IC3	PQVIC58257CL	IC	1
IC4	PQVIMS6242BS	IC	1
IC5	PQVIR96DFX	IC	1
IC6	PQVIE58R72F	IC	1
IC7	MN4464S08LL	IC S	1
IC8	PQVISN7H244S	IC	1
IC9	PQVIPD7H245G	IC S	1
IC10	PQVIMM1045BF	IC	1
IC11	PQVIMS8C5A2G	IC S	1
IC12	PQVILC89066M	IC	1
IC13	PQVINJM2901M	IC	1
IC14	PQVINJM082BM	IC	1
IC15	PQVINJM082BM	IC	1
IC16	PQVINJM4558M	IC	1
IC17	PQVITC4053BF	IC	1
IC18	PQVINJM4558M	IC	1
IC19	PQVIBA12003	IC S	1

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Ref. No.	Part No.	Part Name & Description		Pcs
IC20	PQVIBA12003	IC	S	1
IC21	PQVIM7H04F	IC	S	1
IC22	PQVITC7S00FL	IC	S	1
		(TRANSISTORS)		
Q1, 2	2SB1322	TRANSISTOR(SI) (or 2SB1237R)		2
Q3, 4	2SB1240AR	TRANSISTOR(SI)		2
Q6	2SD1819A	TRANSISTOR(SI) (or 2SC4155R)	S	1
Q7	2SB1218A	TRANSISTOR(SI)		1
		(or 2SA1576R/2SA1603R)	S	
Q8-11	2SD1819A	TRANSISTOR(SI) (or 2SC4155R)	S	4
Q12	2SD1994A	TRANSISTOR(SI)		1
Q14	PQVTDTC114EU	TRANSISTOR(SI) (or UN5211)		1
		(DIODES)		
D1	MA4051	DIODE(SI)		1
D2	1SS120	DIODE(SI) (or 1SS131)		1
D3	1SS120	DIODE(SI) (or 1SS131)		1
D4	1SS120	DIODE(SI) (or 1SS131)		1
D5	1SS147	DIODE(SI)		1
D6	1SS147	DIODE(SI)		1
D7	PQVD1SR354A	DIODE(SI)		1
D8	MA4270	DIODE(SI)		1
D9	MA7200	DIODE(SI)		1
D10	MA7200	DIODE(SI)		1
D11	1SS120	DIODE(SI) (or 1SS131)		1
D13	1SS120	DIODE(SI) (or 1SS131)		1
D14	1SS120	DIODE(SI) (or 1SS131)		1
D15	1SS120	DIODE(SI) (or 1SS131)		1
D16	1SS120	DIODE(SI) (or 1SS131)		1
D17	1SS120	DIODE(SI) (or 1SS131)		1
D18	1SS120	DIODE(SI) (or 1SS131)		1
D21	PQVDHZS3A1	DIODE(SI)		1
		(FILTER & COIL)		
LP1	EXCEMT220B	NOISE FILTER		1
L2	PQLQR1ET	COIL		1
		(COMPONENTS COMBINATIONS)		
RA1, 2	PQRSLD4X103J	RESISTOR ARRAY		2
		(CRYSTAL OSCILLATORS)		
X1	PQVCJ2400N9Z	CRYSTAL OSCILLATOR		1
X2	PQVCL3276N6Z	CRYSTAL OSCILLATOR		1
X3	PQVCJ1600N9Z	CRYSTAL OSCILLATOR		1
		(CAPACITORS)		
C1, 2, 3	PQCUV1E104MD	0.1		3
C4	PQCUV1H103KB	0.01		1
C5	PQCUV1H103KB	0.01		1
C6	PQCUV1E104MD	0.1		1
C7	PQCUV1E104MD	0.1		1
C8	PQCUV1E104MD	0.1		1
C9	PQCUV1E104MD	0.1		1
C10, 11	PQCUV1H180JC	18P		2
C13	PQCUV1C334ZF	0.33		1
C14	ECEA0JK221	220		1
C15	PQCUV1E104MD	0.1		1
C16	PQCUV1H390JC	39P		1
C17	PQCUV1H180JC	18P		1
C18	PQCUV1H102J	0.001		1
C19	PQCUV1E104MD	0.1		1
C20	PQCUV1E104MD	0.1	S	1
C21	PQCUV1H102J	0.001		1
C22	PQCUV1E104MD	0.1		1
C23	PQCUV1H331JC	330P		1
C24	PQCUV1E104MD	0.1	S	1
C25	PQCUV1E104MD	0.1		1
C27	ECEA0JK221	220		1
C28, 29	ECEA1CK101	100		2

Ref. No.	Part No.	Value		Pcs
C30	PQCUV1E104MD	0.1		1
C31	PQCUV1C334ZF	0.33		1
C32, 34	PQCUV1E104MD	0.1		2
C36	PQCUV1E473MD	0.047		1
C37	PQCUV1E104MD	0.1		1
C38	PQCUV1H180JC	18P		1
C39	PQCUV1H120JC	12P		1
C40	PQCUV1E104MD	0.1		1
C41	PQCUV1E104MD	0.1		1
C42	PQCUV1E104MD	0.1		1
C43	PQCUV1E104MD	0.1		1
C44	PQCUV1E104MD	0.1		1
C45	PQCUV1H103KB	0.01		1
C46-49	PQCUV1E104MD	0.1		4
C50	PQCUV1E104MD	0.1		1
C51	PQCUV1E104MD	0.1		1
C52	PQCUV1E104MD	0.1		1
C53	ECEA1VKA330	33		1
C54	ECEA1VKA330	33		1
C55	PQCUV1E104MD	0.1		1
C56	PQCUV1E104MD	0.1		1
C57	PQCUV1E104MD	0.1		1
C58	PQCUV1E104MD	0.1		1
C59	PQCUV1E104MD	0.1		1
C60	PQCUV1E104MD	0.1		1
C61	PQCUV1E104MD	0.1		1
C62	ECEA1CK101	100	S	1
C63	ECEA1CK101	100		1
C64	PQCUV1H103KB	0.01		1
C65	PQCUV1H221JC	220P		1
C66	PQCUV1H101JC	100P		1
C67	PQCUV1H103KB	0.01		1
C68	ECEA1CK101	100		1
C69	PQCUV1H682KB	0.0068		1
C70	PQCUV1H103KB	0.01		1
C71	PQCUV1E104MD	0.1		1
C72	PQCUV1H103KB	0.01		1
C75	ECEA0JK221	220		1
C76	PQCUV1E104MD	0.1		1
C77	PQCUV1E104MD	0.1		1
C78	PQCUV1H101JC	100P		1
C80	ECEA1CK101	100		1
C81	ECUV1H560JCV	56P		1
C82	ECUV1H560JCV	56P		1
C83	ECUV1H560JCV	56P		1
C84	ECUV1H560JCV	56P		1
C85	ECUV1H560JCV	56P		1
C86	ECUV1H560JCV	56P		1
C87	ECUV1H560JCV	56P		1
C88	ECUV1H560JCV	56P		1
C89	ECUV1H560JCV	56P		1
C90	ECUV1H560JCV	56P		1
C91	ECUV1H560JCV	56P		1
C92	ECUV1H560JCV	56P		1
C93	ECUV1H560JCV	56P		1
C94	ECUV1H560JCV	56P		1
C95	ECUV1H560JCV	56P		1
C96	ECUV1H560JCV	56P		1
C97	ECUV1H560JCV	56P		1
C98	ECUV1H560JCV	56P		1
C99	ECUV1H560JCV	56P		1
C100-103	ECUV1H560JCV	56P		4
C104	PQCUV1H270JC	27P		1
C106	PQCUV1H472KB	0.0047		1

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Ref. No.	Part No.	Value	Pcs
		(RESISTORS)	
R1	PQ4R10XJ103	10K	1
R4, 5	PQ4R10XJ000	0	2
R6	PQ4R10XJ473	47K	1
R7	PQ4R10XJ123	12K	1
R8	ERDS2TJ3R3	3.3	1
R9	PQ4R10XJ473	47K	1
R10	PQ4R10XJ563	56K	1
R11, 12	PQ4R10XF8662	86.6K	2
R13	PQ4R10XJ683	68K	1
R14	PQ4R10XJ272	2.7K	1
R15	PQ4R10XF1002	10K	1
R16	PQ4R10XF3652	36.5K	1
R17	ERDS2TJ221	220	1
R18	PQ4R10XJ222	2.2K	1
R19	PQ4R10XJ105	1M	1
R21	PQ4R10XJ222	2.2K	1
R22	PQ4R10XJ562	5.6K	1
R23	PQ4R10XJ222	2.2K	1
R24	PQ4R10XJ152	1.5K	1
R25	PQ4R10XJ000	0	1
R26	PQ4R10XJ154	150K	1
R27	PQ4R10XJ472	4.7K	1
R29	PQ4R10XJ223	22K	1
R30	PQ4R10XJ104	100K	1
R31	PQ4R10XJ562	5.6K	1
R32	PQ4R10XJ682	6.8K	1
R33	PQ4R10XJ471	470	1
R34	PQ4R10XJ472	4.7K	1
R35	PQ4R10XJ475	4.7M	1
R36	PQ4R10XJ471	470	1
R37	PQ4R18XJ000	0	1
R38	PQ4R10XJ123	12K	1
R39	PQ4R10XJ563	56K	1
R40	PQ4R10XJ154	150K	1
R41	PQ4R10XJ562	5.6K	1
R42, 43	PQ4R10XJ563	56K	2
R44	PQ4R10XJ000	0	1
R45	PQ4R10XJ563	56K	1
R46	PQ4R10XJ000	0	1
R47	PQ4R10XJ563	56K	1
R48	PQ4R10XJ684	680K	1
R49	PQ4R10XJ562	5.6K	1
R50	PQ4R10XJ563	56K	1
R51	PQ4R10XJ223	22K	1
R52	PQ4R10XJ331	330	1
R53	PQ4R10XJ563	56K	1
R54	PQ4R10XJ000	0	1
R55	PQ4R10XJ563	56K	1
R56	PQ4R10XJ682	6.8K	1
R57	PQ4R10XJ473	47K	1
R58	ERDS2TJ122	1.2K	1
R59	ERDS2TJ562	5.6K	1
R62	PQ4R10XJ563	56K	1
R63	PQ4R10XJ562	5.6K	1
R65	PQ4R10XJ563	56K	1
R66	PQ4R10XJ562	5.6K	1
R67, 68	PQ4R10XJ563	56K	2
R69	PQ4R10XJ562	5.6K	1
R70, 71	PQ4R10XJ183	18K	2
R73-80	PQ4R10XJ101	100	8
R81	ERDS2TJ222	2.2K	1
R82	PQ4R10XJ821	820	1
R83	ERDS2TJ222	2.2K	1
R84	PQ4R10XJ821	820	1
R85	PQ4R10XJ222	2.2K	1

Ref. No.	Part No.	Part Name & Description	Pcs
R86	PQ4R10XJ103	10K	1
R87	PQ4R10XJ332	3.3K	1
R88	PQ4R10XJ332	3.3K	1
R89	ERDS2TJ561	560	1
R90	PQ4R10XJ222	2.2K	1
R91	ERDS2TJ331	330	1
R92	PQ4R10XJ103	10K	1
R93	PQ4R10XJ472	4.7K	1
R94	PQ4R10XJ222	2.2K	1
R95	PQ4R10XJ103	10K	1
R96	PQ4R10XJ682	6.8K	1
R97	PQ4R10XJ332	3.3K	1
R98	PQ4R10XJ182	1.8K	1
R99	PQ4R10XJ472	4.7K	1
R100	PQ4R10XJ103	10K	1
R101	PQ4R10XJ391	390	1
R102	PQ4R10XJ103	10K	
R103	ER016CKF1201	1.2K	1
R104	ER016CKF1801	1.8K	1
R105	ER016CKF1501	1.5K	1
R106	PQ4R10XJ272	2.7K	1
R107	PQ4R10XJ101	100	1
R108	PQ4R10XJ272	2.7K	1
R109	PQ4R10XJ102	1K	1
R110	PQ4R10XJ151	150	1
R112	PQ4R10XJ275	2.7M	1
R120	PQ4R10XJ101	100	1
R121	PQ4R10XJ563	56K	1
R122	PQ4R10XJ563	56K	1
R123	PQ4R10XJ563	56K	1
R124	PQ4R10XJ563	56K	1
R125	PQ4R10XJ563	56K	1
R126	PQ4R10XJ563	56K	1
R127	PQ4R10XJ563	56K	1
R128	PQ4R10XJ563	56K	1
R129	PQ4R10XJ472	4.7K	1
R130	PQ4R10XJ123	12K	1
R131	PQ4R10XJ101	100	1
R132	PQ4R10XJ101	100	1
R133	PQ4R10XJ101	100	1
R134	PQ4R10XJ221	220	1
R135	PQ4R10XJ101	100	1
R137	PQ4R10XJ101	100	1
R147	ERDS2TJ681	680	1
R148	PQ4R18XJ821	820	1
R149	PQ4R18XJ821	820	1
R150	PQ4R18XJ470	47	1
R151	PQ4R10XJ100	10	1
R153	PQ4R10XJ101	100	1
R154	PQ4R10XJ562	5.6K	1
R155	ERDS2TJ102	1K	1
		(BATTERY & CONNECTORS)	
BA1	PQPCR2032H09	LITHIUM BATTERY	1
CN1	PQJP11A19Z	CONNECTOR, 11P	1
CN2	PQJP11A19Z	CONNECTOR, 11P	1
CN3	PQJP12A22Z	CONNECTOR, 12P	1
CN4	PQJP11A19Z	CONNECTOR, 11P	1
CN5	PQJP08G100Z	CONNECTOR, 8P	1
CN6	PQJP09G100Z	CONNECTOR, 9P	1
CN7	PQJP02G100Z	CONNECTOR, 2P	1
CN8, 9	PQJP05G100Z	CONNECTOR, 5P	2
CN10	PQJP4D94Z	CONNECTOR, 4P	1
CN11	PQJP3D94Z	CONNECTOR, 3P	1
CN13	PQJP03G100Z	CONNECTOR, 3P	1
CN14	PQJP08A22Z	CONNECTOR, 8P	1

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Ref. No.	Part No.	Part Name & Description		Pcs
		ANALOG BOARD PARTS		
PCB2	PQLP10002M	ANALOG BOARD ASSY (RTL)		1
		(ICs)		
IC1	PQVISC79054A	IC		1
IC2	PQVINJM4558D	IC	S	1
IC3	PQVIMT3274AE	IC	S	1
IC4	PQVINJM4558M	IC		1
IC6	PQVITC4066BF	IC		1
IC7	PQVITAD001M1	IC		1
IC8	PQVINJM4558D	IC	S	1
IC9	PQVITC4066BF	IC		1
IC10	PQVINJ4053BM	IC		1
IC11	AN6181NK	IC		1
IC12	PQVIBA6220	IC		1
IC13	PQVINJM4558M	IC		1
IC14	PQVINJM4558D	IC	S	1
IC15	PQVI672191F	IC	S	1
IC16	PQVINJM4558M	IC		1
		(TRANSISTORS)		
Q1	2SA1627	TRANSISTOR(SI)		1
Q2	2SD1819A	TRANSISTOR(SI) (or 2SC4155R)	S	1
Q3	2SC2235	TRANSISTOR(SI)		1
Q6	PQVTDTC143E	TRANSISTOR(SI) (or UN521L)	S	1
Q10	PQVTDTC143E	TRANSISTOR(SI) (or UN521L)	S	1
Q11	PQVTDTC143E	TRANSISTOR(SI) (or UN521L)	S	1
Q14	2SB1218A	TRANSISTOR(SI)		1
		(or 2SA1576R, 2SA1602F, 2SA1603R)	S	
Q15	2SD1819A	TRANSISTOR(SI) (or 2SC4155R)	S	1
Q16	2SD1994A	TRANSISTOR(SI)		1
Q17	2SD1819A	TRANSISTOR(SI) (or 2SC4155R)	S	1
Q18	2SD1819A	TRANSISTOR(SI) (or 2SC4155R)	S	1
Q19	PQVTDTC143E	TRANSISTOR(SI) (or UN521L)	S	1
Q20	2SD1994A	TRANSISTOR(SI)		1
Q21	2SB1322	TRANSISTOR(SI) (or 2SB1237R)	S	1
Q22	2SB1322	TRANSISTOR(SI) (or 2SB1237R)	S	1
Q23	2SC1740S	TRANSISTOR(SI)		1
Q24	2SC1652	TRANSISTOR(SI)		1
Q25	2SC1652	TRANSISTOR(SI)		1
Q26	2SB1322	TRANSISTOR(SI) (or 2SB1237R)	S	1
Q27	2SB1322	TRANSISTOR(SI) (or 2SB1237R)	S	1
Q28	PQVTDTC143E	TRANSISTOR(SI) (or UN521L)	S	1
Q29	2SD1994A	TRANSISTOR(SI)		1
Q30	PQVTDTC143E	TRANSISTOR(SI) (or UN521L)	S	1
Q31	2SD2136	TRANSISTOR(SI)		1
		(DIODES)		
D1	MA4150	DIODE(SI)		1
D2	1SS131	DIODE(SI)		1
D3	PQVDHZS2B1	DIODE(SI)		1
D4	PQVDHZS2B1	DIODE(SI)		1
D8	1SS131	DIODE(SI)		1
D11	PQVDHZS2B1	DIODE(SI)		1
D14	1SS131	DIODE(SI)		1
D15	1SS131	DIODE(SI)		1
D16, 17	MA4056	DIODE(SI)		2
D18	MA4068	DIODE(SI)		1
D25, 26 ,28, 29	1SS131	DIODE(SI)		4
D30	PQVDS1YB40F1	DIODE(SI)		1

Ref. No.	Part No.	Part Name & Description		Pcs
		(COILS)		
L1	PQLE106	COIL	S	1
L2	PQLE106	COIL	S	1
L3	PQLE106	COIL	S	1
L4	PQLE106	COIL	S	1
L11, 12	PQLQR1ET	COIL (FERRITE BEAD)		2
		(PHOTO ELECTRIC TRANSDUCERS)		
PC1	PQVIPC814K	PHOTO COUPLER	⚠	1
PC2	PQVIPC817CD	PHOTO COUPLER	⚠	1
PC3	PQVIPC817CD	PHOTO COUPLER	⚠	1
PC4	PQVITLP627	PHOTO COUPLER	⚠S	1
		(RELAY)		
RLY1	PQSL135Z	RELAY		1
		(VARISTORS)		
SA1	PQVDRA311PT2	VARISTOR (SURGE ABSORBER)		1
SA2	PQVDDSA102MS	VARISTOR (SURGE ABSORBER)		1
		(SWITCHES)		
S1	PQSS2A27Z	SWITCH, DIALING MODE		1
S2	ESE14A211	SWITCH, HOOK		1
S3	PQSS3A17Z	SWITCH, RINGER		1
S4	ESE14A211	SWITCH, COVER		1
S5	PQSS3A17Z	SWITCH, HANDSET VOLUME		1
		(TRANSFORMERS)		
T1	ETA14Y180AY	TRANSFORMER	⚠S	1
T2	PQLT8F5A	TRANSFORMER	⚠	1
		(VARIABLE RESISTORS)		
VR2	EVNDXAA03B52	VARIABLE RESISTOR, 500Ω (B)		1
VR3	EWAUCCT50625	VARIABLE RESISTOR, VOLUME		1
		(CERAMIC FILTER)		
X3	PQVBT4.19G2	CERAMIC FILTER		1
		(CAPACITORS)		
C1	ECQE2E224JZ	0.22		1
C2	PQCUV1H103KB	0.01		1
C3	ECEA1AU221	220	S	1
C4, 5	PQCUV1H103KB	0.01		2
C6, 7	ECKD2H681KB	680P		2
C9	PQCUV1H102J	0.001		1
C10	PQCUV1H103KB	0.01		1
C11	PQCUV1C683MD	0.068		1
C12	ECEA1HKS100	10		1
C13	PQCUV1C683MD	0.068		1
C14	PQCUV1H392KB	0.0039		1
C15	PQCUV1H121JC	120P		1
C16	PQCUV1C683MD	0.068		1
C17	PQCUV1H392KB	0.0039		1
C18, 19	PQCUV1E333MD	0.033		2
C20	PQCUV1H470JC	47P		1
C21	PQCUV1C683MD	0.068		1
C22	ECEA1HKS4R7	4.7		1
C23	PQCUV1H102J	0.001		1
C24	PQCUV1H470JC	47P		1
C25	PQCUV1H103KB	0.01		1
C26	ECEA0JU102	1000		1
C28	PQCUV1H103KB	0.01		1
C29	PQCUV1E104MD	0.1	S	1
C30	PQCUV1E104MD	0.1		1
C31	ECEA1EU470	47	S	1
C32	ECEA1HKS4R7	4.7		1

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Ref. No.	Part No.	Value		Pcs
C33	PQCUV1H272KB	0.0027		1
C34	PQCUV1E104MD	0.1	S	1
C35	ECEA1HKS010	1		1
C36	ECEA1HKS010	1		1
C37	PQCUV1E104MD	0.1	S	1
C38	PQCUV1E104MD	0.1	S	1
C39	ECEA1CKS470	47	S	1
C40	ECEA1HKS2R2	2.2		1
C41	PQCUV1H561JC	560P		1
C42	PQCUV1E333MD	0.033		1
C43	ECEA1HKSR22	0.22		1
C44	PQCUV1H103KB	0.01		1
C45	PQCUV1H222KB	0.0022		1
C46	PQCUV1H221JC	220P		1
C47	PQCUV1C683MD	0.068		1
C48	ECEA1HKS010	1		1
C49	PQCUV1E333MD	0.033		1
C50	ECEA1CK101	100		1
C51	ECEA1CKS100	10		1
C52, 53, 54	PQCUV1H103KB	0.01		3
C55	ECEA1AU101	100	S	1
C56	PQCUV1H153KB	0.015		1
C57	PQCUV1H472KB	0.0047		1
C58	PQCUV1C683MD	0.068		1
C60	ECQE2E104KZ	0.1		1
C61	PQCUV1H472KB	0.0047		1
C62, 63	PQCUV1C683MD	0.068		2
C64	PQCUV1H562KB	0.0056		1
C65	ECEA1AU221	220	S	1
C66	PQCUV1E104MD	0.1		1
C67	PQCUV1C683MD	0.068		1
C68	PQCUV1E333MD	0.033		1
C69	ECEA1HNR47S	0.47		1
C70	PQCUV1H103KB	0.01		1
C72	ECEA1EU101	100	S	1
C73	PQCUV1C683MD	0.068		1
C74	ECEA1CU221	220		1
C75	PQCUV1C683MD	0.068		1
C76	ECEA1AU101	100	S	1
C77	PQCUV1E104MD	0.1		1
C79	ECEA1HKSR47	0.47		1
C80, 81	PQCUV1H103KB	0.01		2
C82	ECEA1HKS010	1		1
C83	PQCUV1E333MD	0.033		1
C84, 85	PQCUV1H103KB	0.01		2
C86	PQCUV1H681JC	680P		1
C87	PQCUV1C683MD	0.068		1
C88	ECEA0JU331	330		1
C90	ECEA0JK221	220		1
C91	PQCUV1H103KB	0.01		1
C92	PQCUV1H221JC	220P		1
C93	ECEA1HKS010	1		1
C94	PQCUV1C683MD	0.068		1
C95	ECEA1AU101	100	S	1
C96	ECEA1HKSR22	0.22		1
C97	PQCUV1H223KB	0.022		1
C98	PQCUV1C683MD	0.068		1
C99	PQCUV1H103KB	0.01		1
C100	ECQG1H682JZ	0.0068	S	1
C102	ECEA1HKSR22	0.22		1
C104	PQCUV1H152KB	0.0015		1
C106	PQCUV1H103KB	0.01		1
C107	ECEA1HKS4R7	4.7		1
C108	PQCUV1E473MD	0.047		1
C109, 110	ECEA1CKS100	10		2

Ref. No.	Part No.	Value		Pcs
C111	ECEA0JKS220	22		1
C112	ECEA1HKS010	1		1
C113	PQCUV1H103KB	0.01		1
C114	ECEA1AU101	100	S	1
C115	ECHU1C682GA	0.0068		1
C116	ECQG1H682JZ	0.0068	S	1
C117	PQCUV1H103KB	0.01		1
C118	PQCUV1H331JC	330P		1
C119	PQCUV1E104MD	0.1		1
C120	PQCUV1H103KB	0.01		1
C121	ECQG1H682JZ	0.0068	S	1
C122	ECEA1CK101	100	S	1
C123	ECEA1HKSR22	0.22		1
C124	PQCUV1H103KB	0.01		1
C125	PQCUV1H223KB	0.022		1
C126	ECEA1AU221	220	S	1
C127	PQCUV1C683MD	0.068		1
C128	ECEA1AU101	100	S	1
C130	ECEA1AU221	220	S	1
C131	ECEA1HKS4R7	4.7		1
C132	PQCUV1E333MD	0.033		1
C133	ECEA1EU101	100	S	1
C135	PQCUV1H332KB	0.0033		1
C137	PQCUV1H103KB	0.01		1
C139	PQCUV1E104MD	0.1		1
C140	ECEA1AU101	100	S	1
C141	PQCUV1H103KB	0.01		1
C142	ECEA1AU101	100	S	1
C143	PQCUV1H103KB	0.01		1
C144	PQCUV1H682KB	0.0068		1
C145	PQCUV1H103KB	0.01		1
C146	PQCUV1C683MD	0.068		1
C148, 149	PQCUV1H103KB	0.01		2
C151	PQCUV1H332KB	0.0033		1
C153	PQCUV1E104MD	0.1		1
C155	ECEA1CK101	100		1
C1000	ECUX1E223MB	0.022		1
		(RESISTORS)		
J12	PQ4R10XJ000	0		1
J150, 151, 152	PQ4R18XJ000	0		3
J158	PQ4R10XJ000	0		1
J171	PQ4R10XJ000	0		1
J173	PQ4R10XJ000	0		1
J174	PQ4R10XJ000	0		1
J178	PQ4R10XJ000	0		1
J179	PQ4R10XJ000	0		1
J180	PQ4R10XJ000	0		1
J181	PQ4R10XJ000	0		1
J182	PQ4R18XJ000	0		1
J183	PQ4R10XJ000	0		1
J184	PQ4R10XJ000	0		1
J185	PQ4R10XJ000	0		1
J186	PQ4R10XJ000	0		1
J188	PQ4R10XJ000	0		1
J189	PQ4R10XJ000	0		1
J190	PQ4R10XJ000	0		1
J191	PQ4R10XJ000	0		1
J196	PQ4R10XJ000	0		1
J197	PQ4R10XJ000	0		1
J200	PQ4R10XJ000	0		1
J202	PQ4R10XJ000	0		1
J203	PQ4R10XJ000	0		1

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Ref. No.	Part No.	Value	Pcs
J204	PQ4R10XJ000	0	1
J205	PQ4R10XJ000	0	1
J206	PQ4R10XJ000	0	1
J207	PQ4R10XJ000	0	1
J208	PQ4R10XJ000	0	1
J209	PQ4R10XJ000	0	1
J210	PQ4R10XJ000	0	1
J212	PQ4R10XJ000	0	1
J213	PQ4R10XJ000	0	1
J214	PQ4R10XJ000	0	1
J215	PQ4R10XJ000	0	1
J217	PQ4R18XJ000	0	1
J218	PQ4R10XJ000	0	1
J234	PQ4R10XJ000	0	1
J235	PQ4R10XJ000	0	1
J236	PQ4R10XJ000	0	1
J274	PQ4R10XJ000	0	1
J275	PQ4R10XJ000	0	1
J276	PQ4R10XJ000	0	1
J278	PQ4R10XJ000	0	1
J280	PQ4R10XJ000	0	1
R1	ERD25TJ473	47K	1
R2	ERDS2TJ101	100	1
R3	PQ4R10XJ152	1.5K	1
R4	PQ4R10XJ152	1.5K	1
R5	PQ4R10XJ153	15K	1
R6	PQ4R10XJ153	15K	1
R7	PQ4R18XJ473	47K	1
R8	PQ4R10XJ153	15K	1
R9	PQ4R10XJ104	100K	1
R10	ERDS2TJ472	4.7K	1
R11	PQ4R10XJ153	15K	1
R12	PQ4R10XJ564	560K	1
R13	PQ4R10XJ102	1K	1
R14	PQ4R10XJ105	1M	1
R15	PQ4R10XJ275	2.7M	1
R16	PQ4R10XJ103	10K	1
R17	PQ4R10XJ472	4.7K	1
R18	PQ4R18XJ562	5.6K	1
R19	ERD25TJ564	560K	1
R20	PQ4R10XJ271	270	1
R21	ERDS2TJ182	1.8K	1
R22	PQ4R10XJ104	100K	1
R23, 24, 25	PQ4R10XJ473	47K	3
R26	ER016CKF5360	536	1
R27	PQ4R10XJ102	1K	1
R28	PQ4R10XJ272	2.7K	1
R29	PQ4R10XJ102	1K	1
R30	PQ4R18XJ4R7	4.7	1
R31	PQ4R10XJ104	100K	1
R32	ER016CKF2201	2.2K	1
R33	PQ4R10XJ154	150K	1
R34, 35	PQ4R10XJ104	100K	2
R36	ER016CKF2201	2.2K	1
R37	ER016CKF6190	619	1
R38	ERDS2TJ104	100K	1
R39	PQ4R10XJ334	330K	1
R40	PQ4R10XJ223	22K	1
R41	PQ4R10XJ683	68K	1
R42	PQ4R10XJ104	100K	1
R43	PQ4R10XJ392	3.9K	1
R44	PQ4R10XJ684	680K	1
R45	PQ4R10XJ273	27K	1
R46	PQ4R10XJ683	68K	1
R47	PQ4R10XJ682	6.8K	1

Ref. No.	Part No.	Value	Pcs
R48	PQ4R10XJ124	120K	1
R49	ERDS2TJ473	47K	1
R50	PQ4R10XJ103	10K	1
R51	PQ4R10XJ822	8.2K	1
R52	PQ4R10XJ393	39K	1
R53	PQ4R10XJ682	6.8K	1
R54	PQ4R10XJ103	10K	1
R55	PQ4R10XJ472	4.7K	1
R56	ERDS1TJ153	15K	1
R57	PQ4R10XJ103	10K	1
R58	PQ4R10XJ000	0	1
R59	PQ4R10XJ473	47K	1
R60	PQ4R10XJ101	100	1
R61	PQ4R10XJ100	10	1
R62	PQ4R18XJ103	10K	1
R63	PQ4R10XJ222	2.2K	1
R64	PQ4R10XJ222	2.2K	1
R65	PQ4R10XJ222	2.2K	1
R66	PQ4R10XJ564	560K	1
R67	PQ4R10XJ105	1M	1
R68	PQ4R10XJ682	6.8K	1
R69	PQ4R10XJ335	3.3M	1
R70	PQ4R10XJ185	1.8M	1
R71	PQ4R10XJ474	470K	1
R72	PQ4R10XJ683	68K	1
R73	PQ4R10XJ104	100K	1
R74	PQ4R10XJ475	4.7M	1
R75	PQ4R18XJ122	1.2K	1
R76	PQ4R10XJ183	18K	1
R77	PQ4R10XJ473	47K	1
R78	PQ4R10XJ103	10K	1
R79	PQ4R10XJ222	2.2K	1
R80	PQ4R18XJ124	120K	1
R83	PQ4R10XJ223	22K	1
R85	ERD25TJ223	22K	1
R86	PQ4R10XJ681	680	1
R87	PQ4R10XJ103	10K	1
R88	PQ4R10XJ184	180K	1
R89	PQ4R10XJ393	39K	1
R90	PQ4R10XJ272	2.7K	1
R91	PQ4R10XJ222	2.2K	1
R92	PQ4R10XJ103	10K	1
R93	PQ4R10XJ103	10K	1
R94	ERDS2TJ391	390	1
R95	PQ4R10XJ103	10K	1
R96	PQ4R10XJ682	6.8K	1
R97	ERDS1TJ330	33	1
R98	PQ4R10XJ563	56K	1
R99	PQ4R10XJ225	2.2M	1
R100	PQ4R18XJ154	150K	1
R101	PQ4R10XJ223	22K	1
R102	ERDS2TJ5R6	5.6	1
R103	ERDS2TJ333	33K	1
R104, 105	PQ4R10XJ103	10K	2
R106	PQ4R10XJ472	4.7K	1
R107	PQ4R10XJ681	680	1
R108	ERDS2TJ120	12	1
R109	ERD25TJ103	10K	1
R110	PQ4R10XJ221	220	1
R111, 112	PQ4R10XJ473	47K	2
R113, 114	PQ4R10XJ471	470	2
R115	PQ4R10XJ473	47K	1
R116	PQ4R10XJ151	150	1
R117	PQ4R10XJ221	220	1
R118	PQ4R10XJ102	1K	1
R119	PQ4R10XJ103	10K	1

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Ref. No.	Part No.	Value	Pcs
R121	PQ4R10XJ122	1.2K	1
R122	PQ4R10XJ681	680	1
R123	PQ4R10XJ394	390K	1
R124	PQ4R10XJ563	56K	1
R125	PQ4R10XJ221	220	1
R126	PQ4R10XJ183	18K	1
R127	PQ4R10XJ121	120	1
R128	PQ4R10XJ334	330K	1
R129	PQ4R10XJ222	2.2K	1
R130	PQ4R10XJ224	220K	1
R131	PQ4R10XJ104	100K	1
R132	PQ4R10XJ563	56K	1
R133	PQ4R10XJ563	56K	1
R134	PQ4R10XJ822	8.2K	1
R135	PQ4R10XJ104	100K	1
R136	PQ4R10XJ682	6.8K	1
R137	PQ4R10XJ105	1M	1
R138	PQ4R10XJ2R2	2.2	1
R139	PQ4R10XJ103	10K	1
R140	PQ4R10XJ103	10K	1
R141	PQ4R10XJ102	1K	1
R142	PQ4R10XJ103	10K	1
R143	ERD25TJ103	10K	1
R144	PQ4R10XJ473	47K	1
R145	ERDS2TJ330	33	1
R146	PQ4R10XJ473	47K	1
R147	PQ4R10XJ273	27K	1
R148	PQ4R10XJ000	0	1
R150	PQ4R10XJ392	3.9K	1
R151	PQ4R10XJ562	5.6K	1
R152	PQ4R10XJ152	1.5K	1
R153	ERDS2TJ6R8	6.8	1
R154	PQ4R10XJ474	470K	1
R155	ER016KF10641	0.64K	1
R156	ER016KF21281	1.28K	1
R157	PQ4R10XJ224	220K	1
R158	PQ4R10XJ472	4.7K	1
R159	PQ4R10XJ684	680K	1
R160	PQ4R10XJ222	2.2K	1
R161	PQ4R10XJ152	1.5K	1
R162	PQ4R10XJ393	39K	1
R163	ER016KF21281	1.28K	1
R165	PQ4R10XJ102	1K	1
R166	ERDS1TJ330	33	1
R167	PQ4R10XJ472	4.7K	1
R168	PQ4R10XJ104	100K	1
R169	PQ4R10XJ272	2.7K	1
R170	PQ4R10XJ103	10K	1
R171	PQ4R10XJ473	47K	1
R172	PQ4R10XJ101	100	1
R173	PQ4R10XJ224	220K	1
R174	PQ4R10XJ473	47K	1
R175	PQ4R10XJ564	560K	1
R176	PQ4R10XJ105	1M	1
R177	PQ4R18XJ473	47K	1
R178, 179, 18	PQ4R10XJ104	100K	3
R181	PQ4R10XJ123	12K	1
R183	PQ4R10XJ184	180K	1
R184	PQ4R10XJ124	120K	1
R186, 187	PQ4R10XJ103	10K	2
R188	PQ4R10XJ221	220	1
R189	PQ4R10XJ273	27K	1
R190	PQ4R10XJ123	12K	1
R191	PQ4R10XJ153	15K	1
R192	ERDS1TJ330	33	1
R193	PQ4R10XJ683	68K	1
R194	PQ4R10XJ153	15K	1

Ref. No.	Part No.	Part Name & Description		Pcs
R199	PQ4R10XJ155	1.5M		1
R200	PQ4R10XJ104	100K		1
R202	ERDS2TJ473	47K		1
R203	PQ4R10XJ103	10K		1
R204	PQ4R10XJ103	10K		1
R205	PQ4R10XJ103	10K		1
R206	PQ4R10XJ153	15K		1
		(SPACER, CONNECTORS & JACKS)		
E1	PQHR9451Y	SPACER, HOOK SWITCH		1
CN1	PQJS11A10Z	CONNECTOR, 11P		1
CN2	PQJS11A10Z	CONNECTOR, 11P		1
CN3	PQJP11A17Z	CONNECTOR, 11P		1
CN4	PQJS11A10Z	CONNECTOR, 11P		1
CN5	PQJJ2TAA2Z	JACK, TEL.		1
CN6, 7	PQJP02G100Z	CONNECTOR, 2P		2
CN8	PQJJ1TB18Z	JACK, HANDSET		1
CN9	PQJP09A18Z	CONNECTOR, 9P		1
		OPERATION AND JAM SENSOR BOARDS PARTS		
PCB3	PQLP10007M	OPERATION & JAM SENSOR BOARD ASS'Y (RTL)		1
		(IC)		
IC301	PQVI672191F	IC	S	1
		(TRANSISTORS)		
Q301-317	PQVTDTA114YU	TRANSISTOR(SI)	S	17
Q320, 321, 322	PQVTDTC114EU	TRANSISTOR(SI)	S	3
		(DIODES)		
D301, 302	1SS131	DIODE(SI) (or 1SS120)		2
D303	1SS131	DIODE(SI) (or 1SS120)		1
D304	1SS131	DIODE(SI) (or 1SS120)		1
D305	1SS131	DIODE(SI) (or 1SS120)		1
D306	1SS131	DIODE(SI) (or 1SS120)		1
D307	1SS131	DIODE(SI) (or 1SS120)		1
D308	1SS131	DIODE(SI) (or 1SS120)		1
D309	1SS131	DIODE(SI) (or 1SS120)		1
LED301	PQVDSLZ281B1	LED		1
LED302, 303	LN242RP	LED	S	2
LED304	LN342GPX	LED	S	1
LED305	LN342GPX	LED	S	1
LED306	PQVDSLZ181B1	LED		1
LED307	PQVDSLZ181B1	LED		1
LED308	PQVDSLZ281B1	LED		1
LED309	LN342GPX	LED	S	1
LED310	LN342GPX	LED	S	1
LED311	LN342GPX	LED	S	1
LED312	LN342GPX	LED	S	1
LED313	LN342GPX	LED	S	1
LED314	LN342GPX	LED	S	1
LED315	LN342GPX	LED	S	1
LED316	LN342GPX	LED	S	1
LED317	LN342GPX	LED	S	1
		(PHOTO ELECTRIC TRANSDUCERS)		
PS301	PQVISGKP01	SENSOR, DOCUMENT		1
PS302	PQVISGKP01	SENSOR, READ POSITION		1
PS303	PQVIPS6002	SENSOR, JAM		1
		(SWITCHES)		
S301-304	PQSH1A43Z	SWITCH		4
S305-308	EVQ22405K	SWITCH		4
S309-312	PQSH1A43Z	SWITCH		4
S313-316	EVQ22405K	SWITCH		4
S317-320	PQSH1A43Z	SWITCH		4
S321-353	EVQ22405K	SWITCH		33

This replacement parts list is for U.S.A. version only. Refer to the simplified manual (cover) for other areas.

Ref. No.	Part No.	Part Name & Description	Pcs
		(CAPACITORS)	
C301	PQCUV1E104MD	0.1	1
C302	PQCUV1E104MD	0.1	1
C303	PQCUV1E104MD	0.1	1
C304	PQCUV1E104MD	0.1	1
C305	PQCUV1E104MD	0.1	1
C306	ECEA0JKS101	100	1
C308	PQCUV1H102J	0.001	1
C310	PQCUV1H102J	0.001	1
		(RESISTORS)	
R301-305	PQ4R18XJ331	330	5
R306	PQ4R10XJ331	330	1
R307-311	PQ4R18XJ331	330	5
R312	PQ4R10XJ331	330	1
R313, 314, 315	PQ4R18XJ331	330	3
R316, 317	PQ4R10XJ331	330	2
R319	PQ4R10XJ103	10K	1
R320	PQ4R10XJ101	100	1
R321, 322	PQ4R18XJ103	10K	2
R323-328	PQ4R10XJ103	10K	6
R329	PQ4R10XJ331	330	1
R330	PQ4R10XJ331	330	1
R331	PQ4R10XJ101	100	1
R332	PQ4R10XJ122	1.2K	1
R333	PQ4R10XJ122	1.2K	1
R334	PQ4R10XJ103	10K	1
R335	PQ4R10XJ103	10K	1
R336, 337	PQ4R10XJ103	10K	2
		(CONNECTORS)	
CN301	PQJP12A21Z	CONNECTOR, 12P	1
CN302	PQJP08A21Z	CONNECTOR, 8P	1
CN303	PQJP14A32Z	CONNECTOR, 14P	1
CN304	PQJS03R73Z	CONNECTOR, 3P	1

SWITCHING POWER SUPPLY BOARD PARTS

PCB4	ETXA07D8A	POWER SUPPLY BOARD ASS'Y (RTL) ⚠	1
		(TRANSISTORS)	
Q101	2SK1102	TRANSISTOR(SI) (or 2SK1567, 2SK1805, 2SK1982) S	1
Q201, 202	2SC3311	TRANSISTOR(SI) (or 2SC4640) S	2
Q211	2SK1060	TRANSISTOR(SI) (or 2SK1299, 2SK1804) S	1
Q212	2SC1318	TRANSISTOR(SI) (or 2SC2274) S	1
Q221, 222	2SA1309	TRANSISTOR(SI) (or 2SA1782) S	2

Ref. No.	Part No.	Part Name & Description	Pcs
		(DIODES)	
D101	PQVDS1VBA60	DIODE(SI)	1
D102	MA165	DIODE(SI)	1
D103	PQVDAL01Z	DIODE(SI)	1
D201	MA649	DIODE(SI)	1
D205	MA165	DIODE(SI)	1
D211	MA165	DIODE(SI)	1
D221	PQVDAL01Z	DIODE(SI)	1
D222	PQVDAL01Z	DIODE(SI)	1
D223	PQVDERA81004	DIODE(SI)	1
ZD101	MA4068	DIODE(SI)	1
ZD201	MA4062	DIODE(SI)	1
ZD221	MA4051	DIODE(SI)	1
		(FUSE)	
F101	PQBA1C50NBKL	FUSE ⚠	1
		(RELAY)	
K201	PQSL138Z	RELAY	1
		(COILS & FILTER)	
L101, 102	ELF18D290	CHOKE COIL	2
L103	EXCELDR35	BEAD INDUCTOR	1
L221	ELEV1R0KA	CHOKE COIL	1
		(PRINTED CIRCUIT BOARD)	
MC101	ML32E1	MODULE	1
		(PHOTO ELECTRIC TRANSDUCER)	
PC101	PQVIPC817A	PHOTO COUPLER ⚠	1
		(THERMISTOR)	
TH101	TD4SFL6R0P	THERMISTOR	1
		(TRANSFORMERS)	
T101	ETB28KA802	TRANSFORMER ⚠	1
T201	ETB19KA15	TRANSFORMER ⚠	1
		(VARIABLE RESISTOR)	
VR101	TEASA01B54	SEMI-FIXED, 50KΩ(B)	1
		(VARISTORS)	
Z101	ERZTV5Z271	VARISTOR	1
Z102	ERZC10DK911U	VARISTOR	1
Z103	ERZC10DK751U	VARISTOR	1
Z104	ERZC10DK751U	VARISTOR	1
		(CAPACITORS)	
C101	ECQU2A224MN	0.22	1
C102, 103	ECKRNS221MB	220P	2
C107, 108	ECKRNS222ME	0.0022	2
C109	EC0S2DA331BA	330	1
C111	ECEA1VFS220	22	1
C112	ECKD3A221KBN	220P	1
C202	ECA1VFZ181	180P	1
C203	ECQB1H182KF	0.0018	1
C212	ECQB1H103JF	0.01	1
C213	ECQB1H272JF	0.0027	1
C221	ECEA1VFS220	22	1
C222	ECEA1VFS220	22	1
C223	ECA1AFZ221	220P	1
C224	ECEA1AGE220	22	1

This replacement parts list is for U.S.A. version only. Refer to the simplified manual (cover) for other areas.

Ref. No.	Part No.	Part Name & Description	Pcs
		(RESISTORS)	
R101	ERDS1TJ474	470K	1
R102, 103, 104	ERDS1TJ183	18K	3
R105	ERDS2TJ333	33K	1
R106	ERDS2TJ152	1.5K	1
R107	ERDS2TJ331	330	1
R108	ERG12SJU270	27	1
R109	ERDS2TJ562	5.6K	1
R111	ERG1SJU100	10	1
R112	ERDS1TJ180	18	1
R201	ERDS1TJ222	2.2K	1
R203	ERDS2TJ122	1.2K	1
R204	ERDS2TJ562	5.6K	1
R206	ER0S2TKF3321	3.32K	1
R207	ER0S2TKF3600	360	1
R209	ER0S2TKF8451	8.45K	1
R211	ERDS2TJ223	22K	1
R212	ERDS1TJ820	82	1
R213	ERDS2TJ182	1.8K	1
R214	ERDS2TJ272	2.7K	1
R215, 216	ERDS2TJ332	3.3K	2
R221	ERG1SJU681	680	1
R223	ERDS2TJ152	1.5K	1
R224	ERDS2TJ102	1K	1
R225	ERDS1TJ151	150	1
R226	ERX12SJUR56	0.56	1
		(CONNECTOR)	
CN31	PQJP2D98Z	CONNECTOR, 3P	1
CN301	PQJP6G100Z	CONNECTOR, 6P	1
CN302	PQJS11X41Z	CONNECTOR, 11P	1
		CCD BOARD PARTS	
PCB5	PQWPF150M	CCD BOARD ASS'Y (RTL)	1
		(IC)	
IC2	PQWPF150M	IC (SUPPLIED BY CCD BOARD ASS'Y)	1
		(TRANSISTORS)	
Q401, 402	2SD1819A	TRANSISTOR(SI) (or 2SC4155R) S	2
		(VARIABLE RESISTOR)	
VR401	EVNDXAA03B14	SEMI-FIXED, 10KΩ(B)	1
		(CAPACITORS)	
C401	ECA1CFQ331B	330	1
C403, 404, 405	PQCUV1E104MD	0.1	3
C406	ECEA1CKS100	10	1
		(RESISTORS)	
J401-405	PQ4R18XJ000	0	5
R401, 402	PQ4R10XJ101	100	2
R403	PQ4R10XJ331	330	1
R404	PQ4R10XJ101	100	1
R406	PQ4R10XJ470	47	1
R407	PQ4R10XJ183	18K	1
R408, 409	PQ4R10XJ272	2.7K	2
R410	PQ4R10XJ331	330	1
R411	PQ4R10XJ221	220	1
R412	PQ4R10XJ152	1.5K	1
R415	PQ4R10XJ180	18	1
		(CONNECTOR)	
CN401	PQJS08R65Y	CONNECTOR, 8P	1

Ref. No	Part No.	Part Name & Description	Pcs
		RECORDING PAPER SENSOR BOARD PARTS	
PCB6	PQLP10009M	RECORDING PAPER SENSOR BOARD PARTS ASS'Y (RTL)	1
		(PHOTO ELECTRIC TRANSDUCER)	
PC501	PQVIPS4506	SENSOR S	1
		(RESISTOR)	
R501	ERDS2TJ331	330	1
		(CONNECTOR)	
CN501	PQJS03R68Y	CONNECTOR, 3P	1
		LCD BOARD PARTS	
PCB7	PQLP10004M	LCD BOARD ASS'Y (RTL)	1
		(ICs)	
IC701	PQVIHD66702A	IC	1
		(CAPACITORS)	
C701	PQCUV1E104MD	0.1	1
C702	PQCUV1E104MD	0.1	1
		(RESISTORS)	
R702	PQ4R10XJ683	68K	1
R703	PQ4R10XJ222	2.2K	1
R704	PQ4R10XJ222	2.2K	1
R705	PQ4R10XJ222	2.2K	1
R706	PQ4R10XJ222	2.2K	1
R707	PQ4R10XJ222	2.2K	1
		(OTHERS)	
LCD	PQADCG957TS	LCD	1
E700	PQHR10103Z	LCD GUIDE	1
E701	PQJG10007Z	CONNECTOR	2
CN701	PQJS14X49Z	CONNECTOR, 14P	1
		FIXTURES AND TOOL	
EC1	PQZZ2K12Z	EXTENSION CORD, 2P	3
EC2	PQZZ2K13Z	EXTENSION CORD, 2P	1
EC3	PQZZ3K12Z	EXTENSION CORD, 3P	1
EC4	PQZZ5K6Z	EXTENSION CORD, 5P	2
EC5	PQZZ6K14Z	EXTENSION CORD, 6P	1
EC6	PQZZ8K15Z	EXTENSION CORD, 8P	1
EC7	PQZZ9K7Z	EXTENSION CORD, 9P	1
EC8	PQJS9K2Y	EXTENSION CORD, 9P	1
EC9	PQZZ12K8Z	EXTENSION CORD, 12P	1
EC10	PQJS11K3Z	EXTENSION CORD, 11P	1
EC11	PQZZ11K8Z	EXTENSION CORD, 11P	3
EC12	PQZZ4K6Z	EXTENSION CORD, 4P	1
EC13	PQZZ3K11Z	EXTENSION CORD, 3P	1
EC14	PQZZ8K16Z	EXTENSION CORD, 8P	1
	QZZMWA or PQZZLCT2401A	TEST TAPE (Refer to page 87.)	1
CT	PQZZF150M	CCD TOOL	1
		Notes: 1. CCD Tool, Test Tape and Extension Cords (Ref. No. EC1, EC2, EC5, EC6, EC10) are necessities for servicing. 2. Extension Cords (Ref. No. EC3, EC4, EC7, EC8, EC9, EC11-14) are useful for servicing. (They make servicing easy.)	